Issued June 1969

SOIL SURVEY

Collin County, Texas

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1957–64. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station as part of the technical assistance furnished to the Collin County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Collin County, Tex. contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for agriculture, community development, or recreation.

Locating Soils

All of the soils of Collin County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described and also the page for the capability unit and pasture and hayland group.

Interpretations not included can be developed by using information in the text to group the soils according to their suitability or limitations for the particular use intended. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the capability units and the pasture and hayland groups.

Ranchers and others interested in range can find under "Use of the Soils for Pasture and Hay" groupings of the soils according to their suitability for pasture and hay and also the plants suitable for each grouping.

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, trafficways, and parks in the section "Use of the Soils for Community Development and Recreation."

Engineers and builders will find under "Use of the Soils for Engineering" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Collin County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

Cover picture: Contour farming of wheat and grain sorghum on Houston Black clay, 1 to 3 percent slopes.

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Contents

	Page
How this survey was made	1
General soil map	2
1. Houston Black-Austin association	2
2. Houston Black-Houston association	3
3. Trinity-Frio association	3
4. Houston Black-Burleson association	4
5. Ferris-Houston association	6
6. Wilson-Burleson association	6
Descriptions of the soils	6
Altoga series	8
Austin series	9
Burleson series	10
Crockett series	11
Eddy series	12
Ellis series	13
Engle series	14
Ferris series	15
Frio series	16
Houston series	17
Houston Black series	18
Hunt series	20
Lamar series	21
Lewisville series	22
Stephen series	24
Trinity series	25
Wilson series	26
Use and management of the soils	27
Managing soils used for crops	27
Capability groups of soils	27
Management by capability units	29
Predicted yields on dryland soils	32

Use and management of the soils—Con.	Page
Use of the soils for pasture and hay	32
Pasture and hayland suitability groups	34
Use of the soils for engineering	36
Engineering classification systems	36
Engineering interpretations of the soils	37
Engineering test data	44
Use of the soils for community development and recreation	44
Use of soils for community development	45
Use of soils for recreational development	45
Formation and classification of soils	48
Factors of soil formation	48
Climate	48
Living organisms	49
Parent material	49
Relief	49
Time	49
Processes of soil horizon differentiation	49
Classification of soils	50
Additional facts about the county	51
History	51
Climate	51
Flood prevention	52
Agriculture	52
Crops	52
Livestock	52
Literature Cited	53
Glossary	53
Guide to mapping units	55

Issued June, 1969

SOIL SURVEY OF COLLIN COUNTY, TEXAS

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

COLLIN COUNTY, in the Blackland Prairie part of north-central Texas (fig. 1), has a total area of 886 square miles, or 567,040 acres, including 11,520 acres of water. McKinney, the county seat, is about 35 miles north of Dallas. The town is in a productive farming and livestock area.

In 1960, total population of the county was 41,247. At the present, the population of the county continues to grow as a part of the Dallas metropolitan area.

Growing cotton, wheat, and grain sorghum and raising beef cattle are the principal agricultural enterprises. In 1964, about 53 percent of the land area in the county was cropland and 31 percent was pasture. The rest of the county was used for residential areas and various other purposes.

Most of the soils in Collin County formed under grass vegetation. They dominantly are dark colored and clayey, and they contain some free lime. All but the nearly level soils are susceptible to sheet and gully erosion if they are not protected.

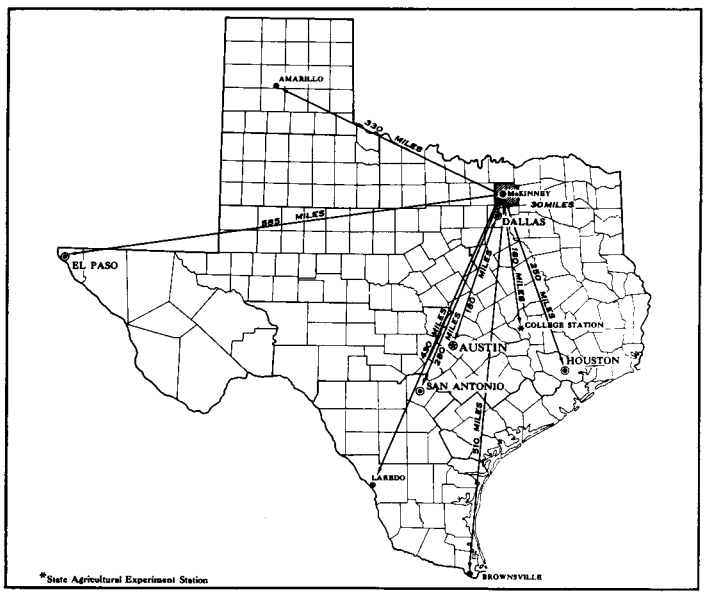

Figure 1.—Location of Collin County in Texas.

[1] Now deceased.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Collin County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped.

Houston Black and Wilson, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Houston Black clay is a soil type in the Houston Black series.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their manage-

ment could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Houston Black clay, 0 to 1 percent slopes, is one of several phases of Houston Black clay, a soil type that ranges from nearly level to moderately sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Stephen-Eddy complex, 3 to 5 percent slopes, eroded.

The soil scientists may also show as one mapping unit two or more soils that are mapped as one unit because their differences are not significant for purposes of the survey. Such a mapping unit is called an undifferentiated soil group. An example is Crockett soils, 2 to 5 percent slopes, eroded.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil surveys. On basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them by further study and by consultation with farmers, agronomists, engineers, and others. The scientists then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this soil survey shows, in color, the soil associations in Collin County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The six soil associations in Collin County are described in the following pages.

1. Houston Black-Austin Association

Gently sloping to sloping, clayey soils that are deep over marl and chalk; on uplands

This association consists of gently sloping to sloping soils on uplands. These soils are mostly in the western part of the county in a broad area that extends from the northern to the southern boundary. The association occupies 52 percent of the county.

The Houston Black soils make up 55 percent of the association; Austin soils, 23 percent; and minor soils, 22 percent. Figure 2 shows the major soils and most of the minor soils in association 1.

The Houston Black soils are gently sloping and uneroded in most places. They have a very dark gray, calcareous clay surface layer that is generally underlain by marl at a depth of about 44 inches. These soils overlie chalk in some places in the western part of the association, but they are over gray and yellow marl in the eastern part.

The Austin soils are more sloping and more eroded than the Houston Black soils. They are mostly in the western part of the association. Austin soils have a dark grayish-brown, calcareous silty clay surface layer about 16 inches thick. Their subsoil is light brownish-gray to pale-brown silty clay and overlies beds of chalk at a depth of about 42 inches. In some places the underlying beds consist of alternating layers of marl and chalk.

Of the minor soils, the Houston are more sloping than the major Houston Black soils. The Stephen soils are shallow to chalk, and the Eddy soils are very shallow to chalky limestone. The Lewisville soils are similar to the major Austin soils, but they formed in alluvial material. The Altoga soils are similar to the Austin soils but are lighter colored. The Trinity soils formed in alluvial material on flood plains.

About 70 percent of this association is cultivated, and the rest is pastured. All crops commonly grown in the county are suitable. The Houston Black soils are well suited to cotton, corn, and grain sorghum. Because they are somewhat droughty, the Austin and nearby minor soils are farmed mainly to small grains, corn, and sweetclover. Cotton root rot causes considerable damage to sweetclover

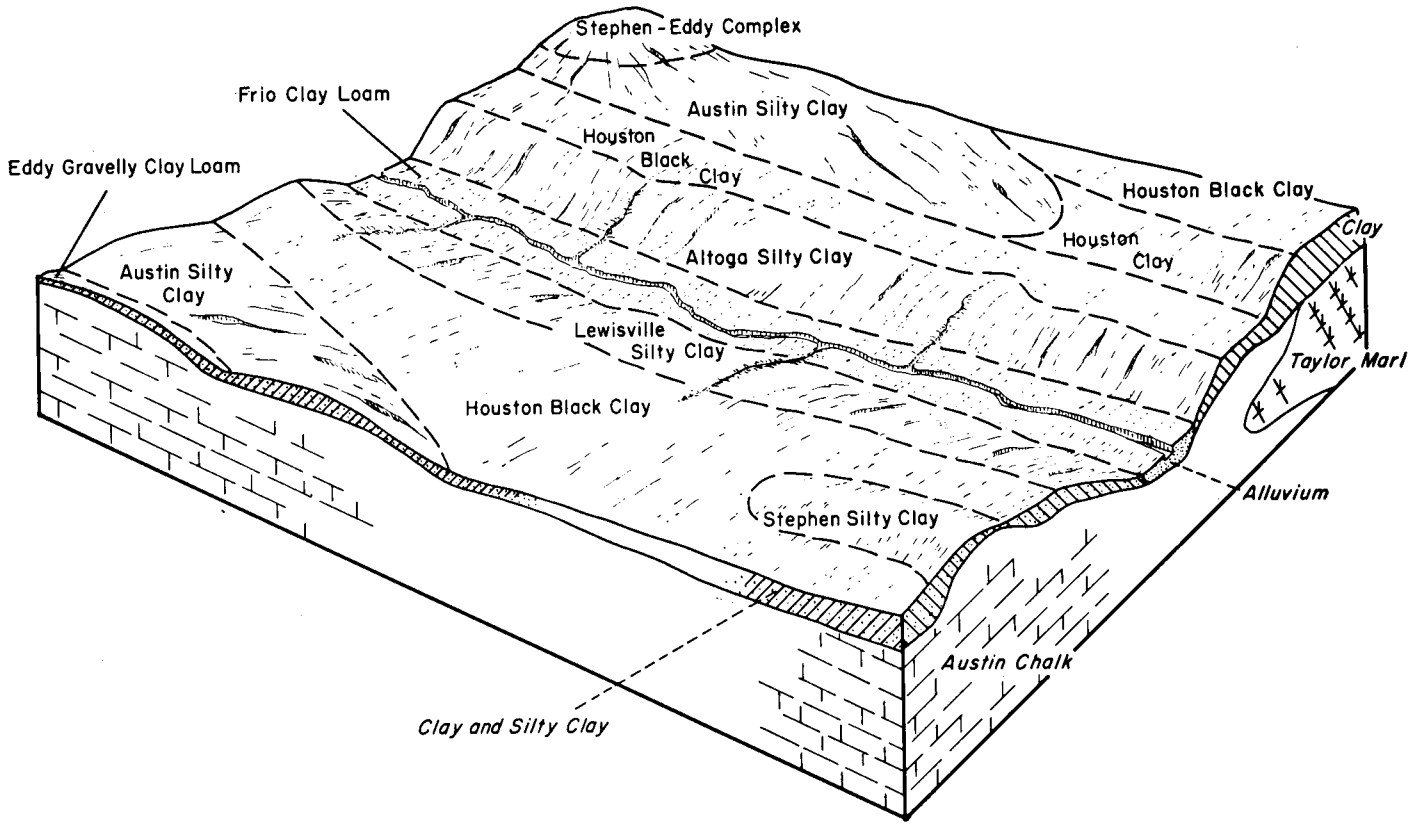

Figure 2.—**Soils and underlying material in association 1.**

and cotton in some areas of Houston Black and Austin soils. Water erosion is moderate to severe where slopes are more than 1 percent.

The average-sized farm in this association is about 140 acres, but farms range from 20 to 900 acres in size. About 60 percent of the owners live on their farms.

2. Houston Black-Houston Association

Gently sloping to sloping, clayey soils that are deep over compact clays; on uplands

This association consists of gently sloping to sloping soils on uplands. These soils are mostly in the eastern part of the county, but one small area is in the northwestern part. Soils of this association have rolling topography, and they are eroded in some places. The association covers about 24 percent of the county.

The Houston Black soils make up 50 percent of the association; Houston soils, 35 percent; and minor soils, 15 percent. Figure 3 shows the major soils and most of the minor soils in the association.

The Houston Black soils are in the less sloping and less eroded parts of the association. They have a very dark gray, calcareous clay surface layer that is generally underlain by light-gray clay at a depth of about 44 inches. Beneath this layer is extremely firm clay several feet thick.

The Houston soils are in the more sloping and eroded areas. They have a dark grayish-brown, calcareous clay surface layer about 16 inches thick. The underlying layer is grayish-brown to light brownish-gray, calcareous clay that extends to a depth of at least 60 inches.

Of the minor soils, the Burleson, Wilson, and Hunt soils are on gentle slopes that adjoin the major Houston Black soils. A few small areas of Trinity soils are along the streams. The Lewisville and Ferris soils are near the major Houston soils, but they are in the more sloping and eroded areas.

Water enters these soils rapidly when they are dry and cracked, but it moves very slowly through the soils when the cracks are sealed. Available water capacity is high. In sloping areas the hazard of water erosion is moderate to severe.

About 50 percent of this association is cultivated, and the rest is pastured. Cotton, wheat, corn, grain sorghum, alfalfa, peas, vetch, and sweetclover are the main crops. Common bermudagrass and Coastal bermudagrass are the main pasture plants. Many meadows are in johnsongrass. Many farmers raise beef cattle, sheep, and dairy cattle.

The average-sized farm in this association is about 135 acres, but the farms range from 20 to 800 acres in size. About 45 percent of the owners live on their farms.

3. Trinity-Frio Association

Deep, nearly level, clayey and loamy soils on flood plains

This association consists of the nearly level, deep soils on flood plains along the East Fork of the Trinity River and its tributaries. Most areas occur in the eastern part of the county. The soils consist mostly of alluvial clays and clay loams that have a moderately to slowly permeable subsoil. This association occupies about 10 percent of the county.

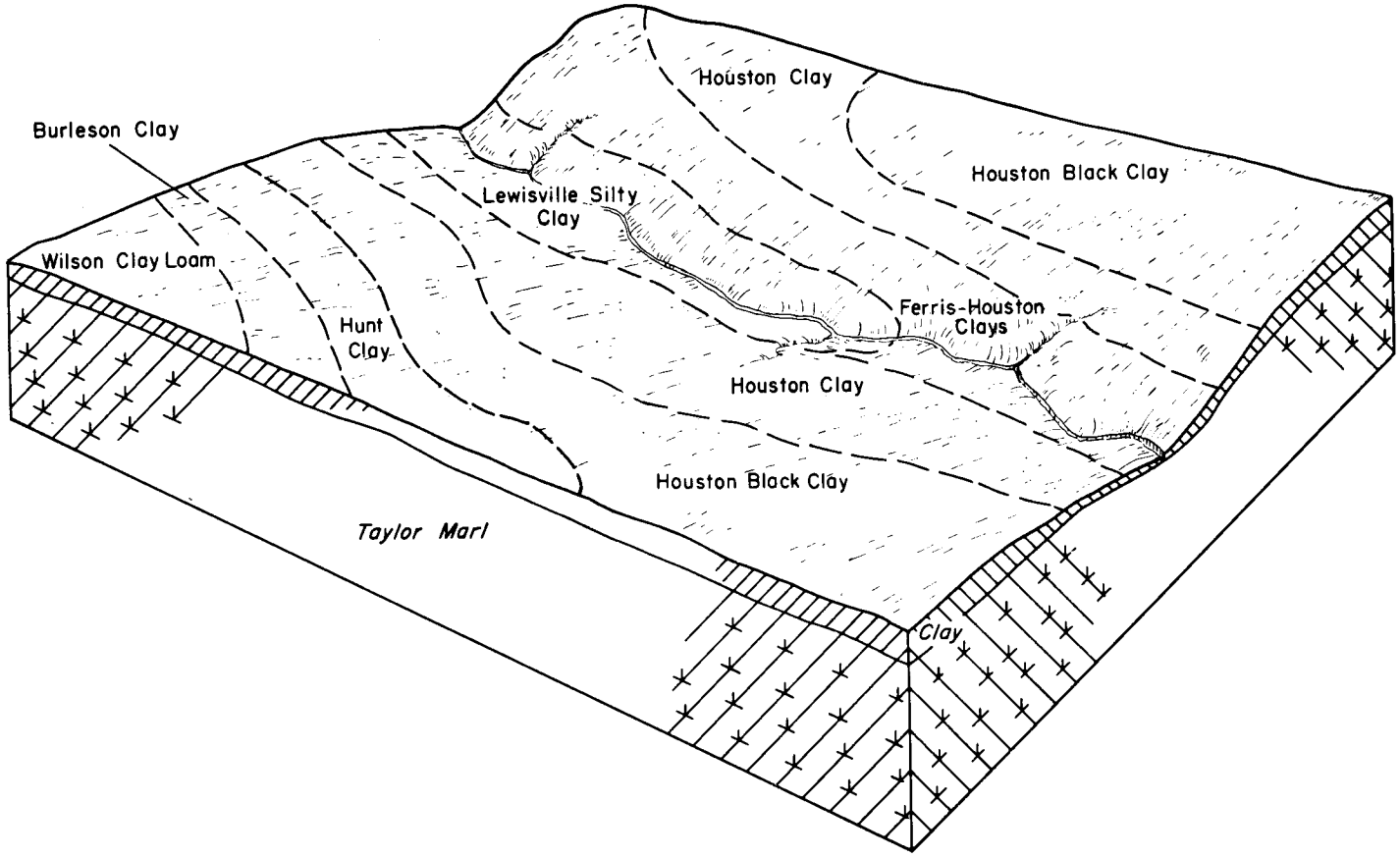

Figure 3.—**Soils and underlying material in association 2.**

The Trinity soils make up 66 percent of the association; Frio soils, 14 percent; and minor soils, 20 percent. Figure 4 shows the major soils and most of the minor soils in association 3.

The Trinity soils are in large areas, mostly on flood plains. They formed in alluvial material that washed mainly from areas of Houston Black and Houston soils. They have a very dark gray, calcareous clay surface layer. Below this layer is dark-gray, very firm clay several feet thick.

The Frio soils are in small areas, normally along the smaller streams in the county. They formed in alluvial material that washed mainly from Austin and Stephen soils. Frio soils have a dark grayish-brown, calcareous clay loam surface layer about 20 inches thick. It overlies grayish-brown heavy clay loam several feet thick.

About half the acreage in the association is subject to frequent flooding. The rest is subject to occasional flooding.

Austin, Burleson, Houston Black, Houston, and Stephen are minor soils in this association. They are in higher upland areas than the Trinity and Frio soils.

The areas of this association that are protected from frequent flooding are used mainly for row crops. The main crops grown in the association are cotton, wheat, oats, grain sorghum, and alfalfa. Several pecan orchards are in the association. The soils that are susceptible to flooding are used for johnsongrass and bermudagrass cut for hay. Some areas are used for grazing. Areas along stream channels and in bottom lands remain in hardwoods and are used mainly as wildlife habitat. A few sheltered spots are suitable for picnicking and other kinds of recreation. In areas where cover is lacking, the soils are subject to soil removal by scouring. Many farms are in this association along the major streams and tributaries.

4. Houston Black-Burleson Association

Nearly level to gently sloping, deep, clayey soils on stream terraces

This association mainly consists of nearly level to gently sloping soils along the major streams in the county. One large area extends along the western boundary and is parallel to a line between the communities of Celina and Frisco. This area occurs on nearly level uplands and is not adjacent to a major stream. The association covers about 8 percent of the county.

The Houston Black soils make up 50 percent of the association; Burleson soils, 25 percent; and minor soils, 25 percent. Figure 5 shows the major soils and most of the minor soils in association 4.

Houston Black soils have a very dark gray clay surface layer. This layer is calcareous, and it overlies light-gray clay at a depth of about 44 inches. Deep cracks form in Houston Black soils when they are dry.

The Burleson soils have a dark-gray, noncalcareous clay surface layer that overlies gray, extremely firm clay at a depth of about 33 inches. Crusts form on the surface of the Burleson soils when they dry.

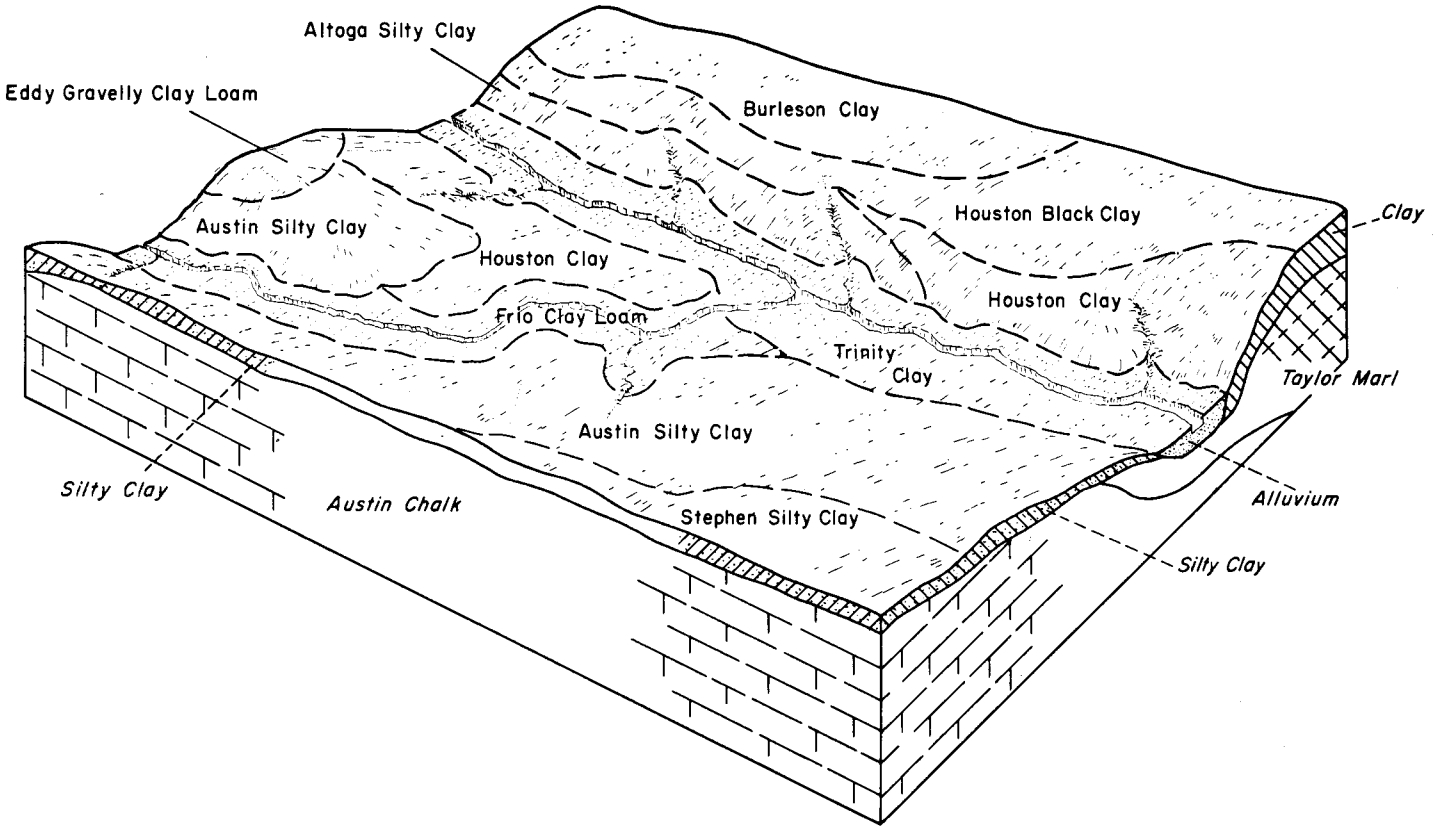

Figure 4.—Soils and underlying material in association 3.

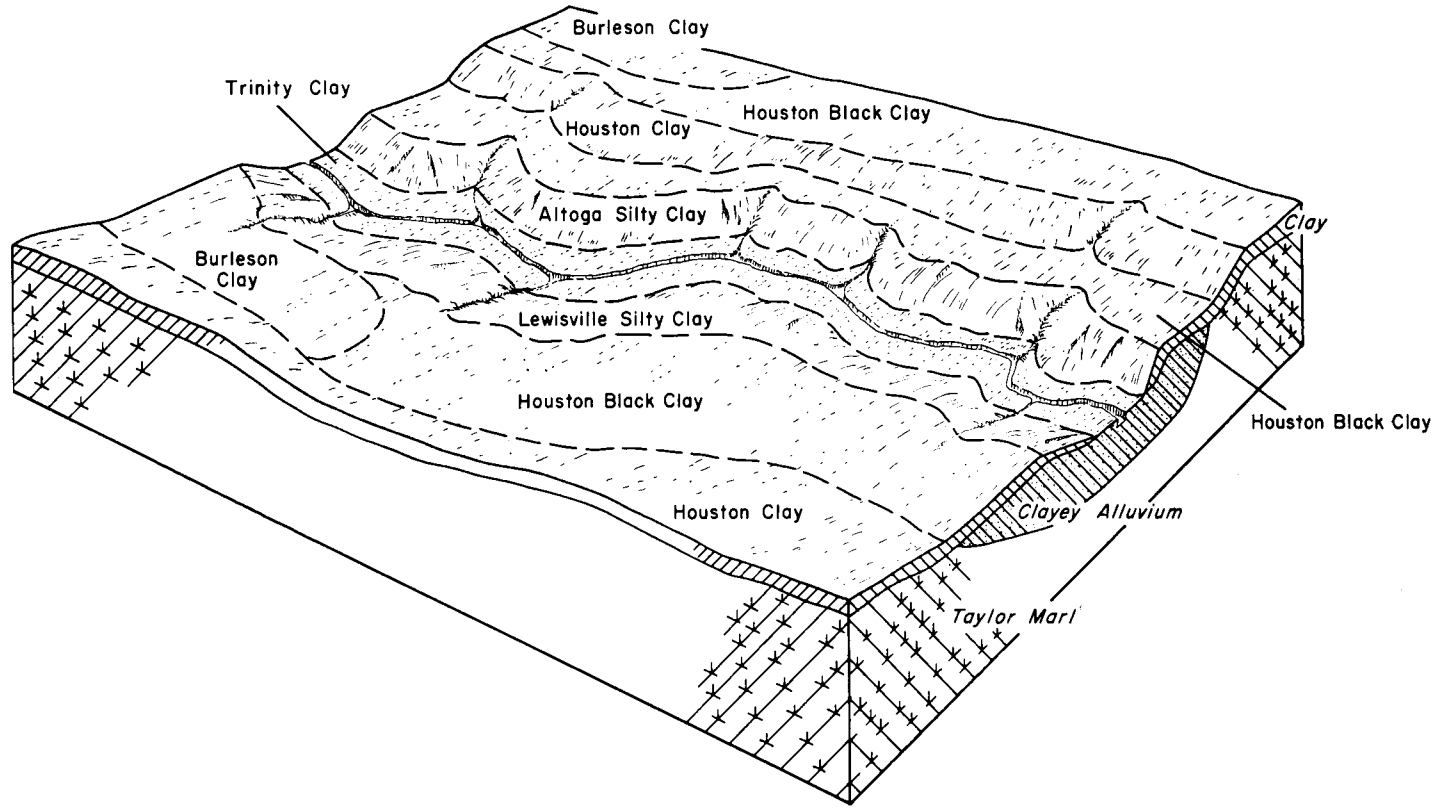

Figure 5.—Soils and underlying material in association 4.

The Lewisville, Altoga, and Houston are minor soils in this association. The Lewisville and Altoga soils are lower in the landscape than the major Houston Black and Burleson soils, are in areas that slope to flood plains, and are browner and more permeable. The Houston soils are more sloping and browner than the major Houston Black.

Water moves into the soils in this association rapidly when they are dry and cracked, but water movement is very slow when the cracks are sealed. Capacity for storing moisture is high. In sloping areas, water erosion is a slight to moderate hazard.

Most of this association is cultivated. All crops commonly grown in the county are suitable. The Houston Black soils are well suited to cotton, corn, and grain sorghum. The Burleson soils are also used for these crops, though crop growth is not so good as on the Houston Black soils. The gently sloping areas of Lewisville and nearby soils are used for small grains and pasture.

The average-sized farm in this association is about 150 acres. Many owners live on their farms.

5. Ferris-Houston Association

Sloping to strongly sloping, eroded, deep, clayey soils on uplands

This association occupies the rolling areas along the east side of Indian Creek. Most of it is in an area that crosses the eastern part of the county, but another area lies south of the community of Farmersville. This association occupies about 3 percent of the county. Most of this association is rolling. Some areas are so gullied that they cannot be crossed by farm machinery. Sheet and gully erosion are moderate to severe. Also, water erosion is moderate to severe in areas not protected by plant cover.

The Ferris soils make up 60 percent of the association; Houston soils, 30 percent; and minor soils, 10 percent.

The Ferris soils are the most sloping and occupy the higher, eroded areas. They have a light olive-brown, calcareous clay surface layer about 6 inches thick. Beneath this is a layer of calcareous clay that is light yellowish brown in the upper part and light gray at a depth of about 60 inches.

The Houston soils occur adjacent to the natural drains below the Ferris soils in most places, but some areas are on narrow ridgetops. The Houston soils have a dark grayish-brown, calcareous clay surface layer about 16 inches thick. It overlies a layer of grayish-brown to light brownish-gray limy clay that extends to a depth of at least 60 inches. In areas where erosion is severe, the surface layer is yellowish brown.

Minor soils in this association are the Houston Black in narrow, gently sloping areas on ridgetops; the eroded Lamar soils in areas sloping toward drains; and the Crockett soils in eroded areas.

About 90 percent of this association is pastured; the rest is cultivated. Small grains are the main crops and are used for winter grazing. Stands of native grasses are poor to fair.

The average-sized farm in the association is about 300 acres. Most of the farm homes have been abandoned, and the people have moved to adjacent communities.

6. Wilson-Burleson Association

Nearly level to gently sloping, deep, loamy and clayey soils on uplands

This association consists of nearly level to gently sloping soils on uplands. Most of it is in small areas along the eastern boundary of the county, though a small area is in the extreme northwestern part. The association occupies about 3 percent of the county.

Wilson soils make up about 65 percent of this association; Burleson soils, 30 percent; and minor soils, 5 percent. Figure 6 shows the major soils and most of the minor soils in this association.

The Wilson soils have a dark-gray, noncalcareous clay loam surface layer about 7 inches thick. It overlies a dense, gray clay subsoil that extends to a depth of about 36 inches. The underlying material is light-gray, extremely firm, limy clay.

The Burleson soils have a dark-gray clay surface layer that overlies gray, extremely firm clay at a depth of about 33 inches. The surface layer is medium acid to slightly acid. Crusts form on the surface when Burleson soils dry.

Among the minor soils are the Houston Black, Houston, and Crockett soils. Houston Black soils are calcareous throughout. Houston soils are sloping, are eroded, and have a calcareous surface layer. Crockett soils are gently sloping, eroded, and mottled in the upper part.

The soils of this association have high available water capacity, though they absorb moisture at a very slow rate. The sloping areas are susceptible to slight to moderate erosion.

All crops commonly grown in the county are suitable. In most areas small grains, cotton, grain sorghum, and legumes are grown. Crops grow well because the soils are moderately fertile. Bermudagrass seems to be the best suited pasture plant. Many areas of the Crockett soils that once were cultivated are now pastured; stands of native grasses and of annuals are thin, and there are scattered mixed hardwoods. Beef cattle are raised on many farms.

The average-sized farm in this association is about 140 acres, but the farms range from 50 to 300 acres in size. About half of the owners live on their farms.

Descriptions of the Soils

This section describes the soil series and mapping units of Collin County. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe the soil series and then the mapping units in the series. Thus to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. An essential part of each soil series is the description of the soil profile, the sequence of layers beginning at the surface and continuing down to depths beyond which roots of most plants do not penetrate. Each soil series contains both a brief nontechnical and a detailed technical description of the soil profile. The nontechnical description will be useful to most readers. The detailed technical description is included for soil scientists, engineers, and others who need to make thorough and precise studies of the soils.

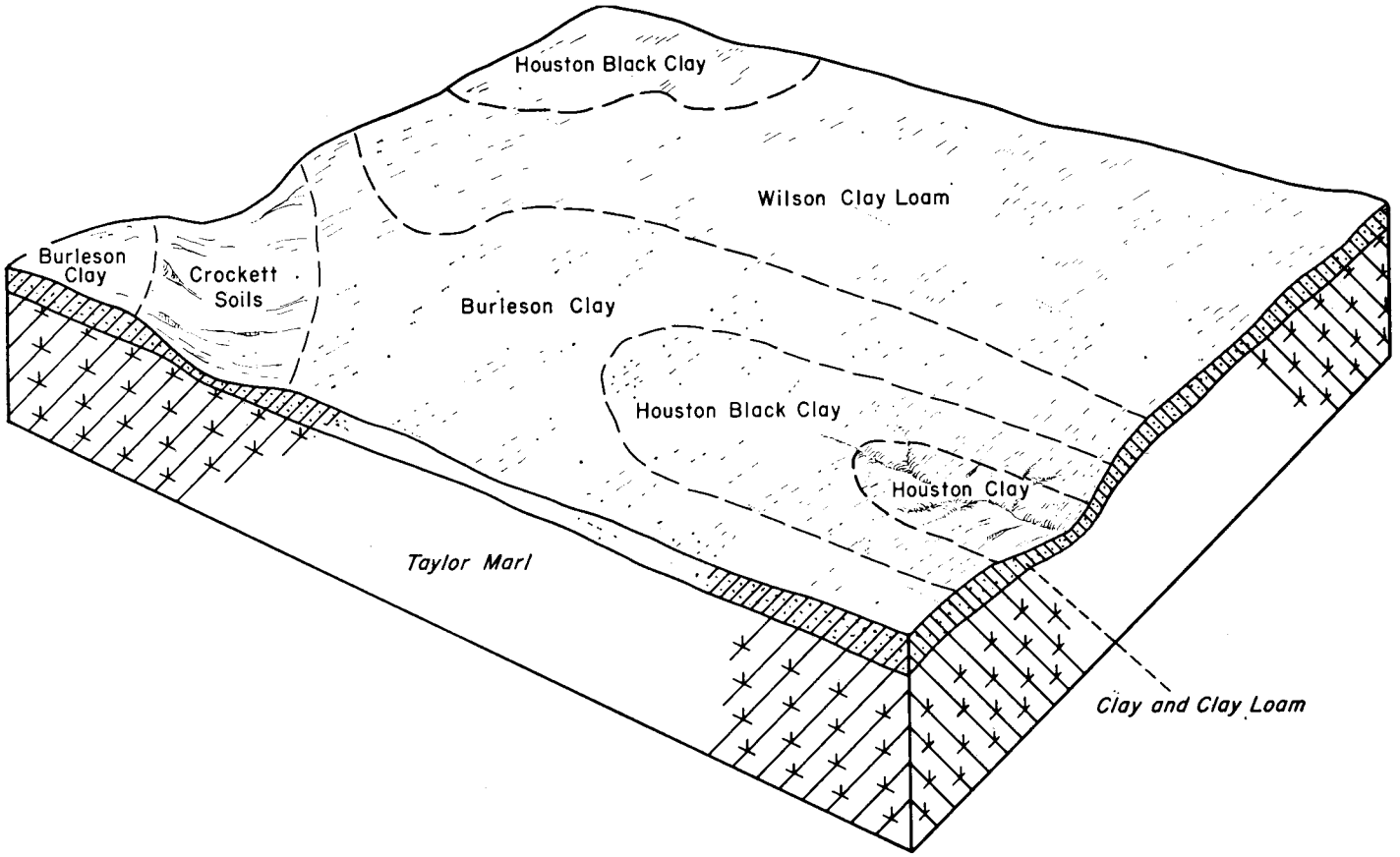

***Figure 6.*—Soils and underlying material in association 6.**

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent [1]	Soil	Area	Extent [1]
	Acres	*Percent*		*Acres*	*Percent*
Altoga silty clay, 5 to 8 percent slopes, eroded	15, 258	2. 7	Houston Black clay, 1 to 3 percent slopes	192, 784	34. 0
Altoga silty clay, 8 to 12 percent slopes, severely eroded	2, 248	. 4	Houston Black clay, 2 to 4 percent slopes, eroded	24, 422	4. 3
Austin silty clay, 1 to 3 percent slopes	23, 554	4. 2	Hunt clay, 0 to 1 percent slopes	1, 289	. 2
Austin silty clay, 3 to 5 percent slopes, eroded	31, 584	5. 6	Hunt clay, 1 to 3 percent slopes	7, 774	1. 4
Austin silty clay, 5 to 8 percent slopes, eroded	13, 956	2. 5	Lamar clay loam, 3 to 5 percent slopes, eroded	476	[2]
Burleson clay, 0 to 1 percent slopes	4, 813	. 8	Lamar clay loam, 5 to 8 percent slopes, eroded	1, 799	. 3
Burleson clay, 1 to 3 percent slopes	10, 025	1. 8	Lamar clay loam, 5 to 12 percent slopes, severely eroded	311	[2]
Burleson clay, 2 to 4 percent slopes, eroded	3, 032	. 5	Lewisville silty clay, 1 to 3 percent slopes	1, 912	. 3
Crockett soils, 2 to 5 percent slopes, eroded	3, 104	. 5	Lewisville silty clay, 3 to 5 percent slopes, eroded	9, 838	1. 7
Crockett soils, 5 to 8 percent slopes, eroded	161	[2]	Stephen silty clay, 1 to 3 percent slopes	7, 459	1. 3
Eddy gravelly clay loam, 1 to 3 percent slopes	1, 575	. 3	Stephen-Eddy complex, 3 to 5 percent slopes, eroded	6, 987	1. 2
Eddy gravelly clay loam, 3 to 8 percent slopes, eroded	12, 516	2. 2	Trinity clay, frequently flooded	29, 181	5. 1
Ellis clay, 3 to 8 percent slopes, eroded	494	[2]	Trinity clay, occasionally flooded	23, 088	4. 1
Engle clay loam, 1 to 3 percent slopes	459	[2]	Wilson clay loam, 0 to 1 percent slopes	1, 524	. 3
Engle clay loam, 3 to 5 percent slopes, eroded	840	. 1	Wilson clay loam, 1 to 3 percent slopes	9, 773	1. 7
Ferris-Houston clays, 5 to 12 percent slopes, severely eroded	14, 896	2. 7	Gravel pits and quarries	136	[2]
Frio clay loam, frequently flooded	2, 211	. 4	Water area	11, 520	2. 0
Frio clay loam, occasionally flooded	6, 373	1. 1			
Houston clay, 3 to 5 percent slopes, eroded	28, 675	5. 1	Total	567, 040	100. 0
Houston clay, 5 to 8 percent slopes, eroded	22, 165	3. 9			
Houston Black clay, 0 to 1 percent slopes	38, 828	6. 9			

[1] Percentage of total area in the county.

[2] Less than 0.1 percent.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and the pasture and hayland group in which the mapping unit was placed. The pages on which each capability unit and each pasture and hayland group are described can be found by referring to the "Guide to Mapping Units" at the back of this survey. Many terms used in the soil descriptions and other sections are defined in the Glossary and in the "Soil Survey Manual" (*4*).[2]

Altoga Series

The Altoga series consists of deep, calcareous, light-colored, clayey soils. These soils are sloping to strongly sloping and eroded to severely eroded. They occur on uplands and stream terraces, mainly in the eastern part of the county.

In a typical profile, the surface layer is light brownish-gray light silty clay about 7 inches thick. The subsoil is about 53 inches thick and is pale-brown light silty clay in the upper part and very pale brown silty clay in the lower part. Soft masses of calcium carbonate make up 5 to 10 percent of the lower part, by volume. At a depth of about 60 inches is very pale brown silty clay.

Altoga soils have moderately slow permeability and moderate available water capacity. Natural fertility is moderately low to low. Surface runoff is rapid, and the hazard of water erosion is severe.

Most of the acreage of these soils is pastured; the rest is cultivated. Small grains are the main crops.

Representative profile of an Altoga silty clay (in a cultivated field, 100 feet east of county road, from a point 0.1 mile south of its intersection with a gravel road, or from a point 0.7 mile west of the intersection of the county road and Farm Road 543; this is 5.2 miles northwest of the intersection of the county road and U.S. Highway 75, or is about 1.7 miles north of the intersection of U.S. Highway 75 and Texas Highway 24 in McKinney):

Ap—0 to 7 inches, light brownish-gray (10YR 6/2) light silty clay, grayish brown (10YR 5/2) when moist; weak subangular blocky and weak granular structure; hard when dry, friable when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

B2—7 to 25 inches, pale-brown (10YR 6/3) light silty clay, brown (10YR 5/3) when moist; strong, fine, subangular blocky structure; hard when dry, firm when moist; evidence of worm channels; calcareous; moderately alkaline; gradual, smooth boundary.

B3ca—25 to 60 inches, very pale brown (10YR 7/3) silty clay, yellowish brown (10YR 5/4) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; soft masses of calcium carbonate make up 5 to 10 percent of horizon, by volume; total calcium carbonate equivalent is about 50 percent; calcareous; moderately alkaline; gradual, smooth boundary.

C—60 to 66 inches +, very pale brown (10YR 7/3) silty clay, yellowish brown (10YR 5/4) when moist; few mottles of yellowish brown and grayish brown; moderate, fine, subangular blocky structure; very hard when dry, firm when moist; few masses of soft segregated calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 4 to 15 inches in thickness and from silty clay to heavy clay loam in texture. Total content of clay ranges from 35 to 50 percent, but noncarbonate content of clay is less than 40 percent. When dry, the A horizon has color value of more than 5. When this horizon is moist, value is more than 3.5, hue is 7.5 YR or 10YR, and chroma is 1.5 to 3.5. Surface horizons that have a value of less than 3.5 when moist are less than 7 inches thick.

The B2 horizon ranges from 6 to 18 inches in thickness and from light silty clay to heavy clay loam in texture. Depth to visible calcium carbonate ranges from 10 to 33 inches. In some areas gravel beds several feet thick occur below a depth of 40 inches.

Altoga soils occur closely with the Austin and Lewisville soils. They have a lighter colored and typically thinner surface layer than either the Austin or Lewisville soils.

Altoga silty clay, 5 to 8 percent slopes, eroded (AlD2).—This soil occurs on uplands and stream terraces, mainly in the eastern part of the county. The areas are oblong and average about 35 acres in size. In some places shallow gullies have been cut, but these gullies are crossable by farm machines. In a few places erosion has exposed material from the subsoil. The profile of this soil is the one described as representative for the Altoga series.

Included with this soil in mapping were areas of an Austin silty clay and a Lewisville silty clay. The included areas are 1 to 3 acres in size, and they make up less than 8 percent of any mapped area.

Surface runoff is rapid, the hazard of erosion is severe, permeability is moderately slow, and available water capacity is moderate. Natural fertility is moderately low.

A few fields are cultivated, and about 70 percent of this soil is pasture. Small grains are the main cultivated crops. King Ranch bluestem and common or Coastal bermudagrasses are the chief pasture grasses.

Terraces and contour farming are needed in cultivated fields to control water erosion. In other areas grassed waterways and diversion terraces help to control runoff water and to conserve moisture. (Capability unit IVe–3: pasture and hayland group E)

Altoga silty clay, 8 to 12 percent slopes, severely eroded (AlE3).—This strongly sloping soil occurs on uplands, mainly in the eastern part of the county. The areas are oblong and average about 30 acres in size. Many areas are cut by gullies. The gullies are shallow to deep, and many of them cannot be crossed by farm machines. In a few areas erosion has removed the entire surface layer and has exposed the subsoil. Slopes average about 10 percent.

The surface layer is light brownish-gray, calcareous light silty clay about 4 inches thick. The subsoil is pale-brown light silty clay, of which about 15 percent of the lower part, by volume, is visible calcium carbonate. The substratum begins at a depth of about 35 inches and is pale-brown silty clay.

Included with this soil in mapping were areas of an eroded Austin silty clay. These areas are less than 4 acres in size and cover less than 10 percent of any area mapped.

Surface runoff is rapid, and water erosion is severe in unprotected areas. Permeability is moderately slow, and available water capacity is moderate.

This soil generally is not suited to cultivated crops, because of the hazard of erosion. Also the surface layer is thin and low in organic-matter content. Most of the areas originally cultivated have been returned to native grasses, for which this soil is suited. The chief native vegetation is little bluestem, sidoats grama, and buffalograss. Stands of grasses are thin and weedy. (Capability unit VIe–2; pasture and hayland group I)

[2] Italic numbers in parentheses refer to Literature Cited, p. 53.

Austin Series

The Austin series consists of deep, calcareous, clayey soils that are gently sloping to sloping. These soils formed in clayey marl or chalky limestone on uplands throughout the county.

In a typical profile, the surface layer is about 16 inches thick and consists of dark grayish-brown, calcareous silty clay. The subsoil is calcareous silty clay that is light brownish gray in the upper part and pale brown in the lower part. It is 14 inches thick. The substratum consists of very pale brown silty clay and of lime that makes up about 40 percent of the layer, by volume. At a depth of about 42 inches are alternating beds of chalky limestone and clayey marl.

Permeability is moderately slow. Available water capacity and natural fertility are moderate. The hazard of water erosion is moderate to severe.

Most of the acreage of Austin soils is farmed to small grains and grain sorghum. The rest is used for pasture and hay.

Representative profile of an Austin silty clay (in a cultivated field 180 feet south of Farm Road 1461, from a point 3.4 miles northwest of its intersection with Texas Highway 24, which is about 4.7 miles west of the intersection of Texas Highway 24 and U.S. Highway 75 in McKinney):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; weak granular and weak subangular blocky structure; hard when dry, firm when moist; few, small, strongly cemented concretions of calcium carbonate 1 to 3 millimeters in diameter; calcareous; moderately alkaline; abrupt boundary.

A1—5 to 16 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; very hard when dry, very firm when moist; many worm casts; many, small, strongly and weakly cemented concretions of calcium carbonate 1 to 4 millimeters in diameter; calcareous; moderately alkaline; gradual, wavy boundary.

B21—16 to 24 inches, light brownish-gray (10YR 6/2) silty clay, grayish brown (10YR 5/2) when moist; moderate, fine subangular blocky structure; very hard when dry, very firm when moist; many, small, strongly and weakly cemented concretions of calcium carbonate up to 2 centimeters in diameter; calcareous; moderately alkaline; gradual, wavy boundary.

B22—24 to 30 inches, pale-brown (10YR 6/3) silty clay, brown (10YR 5/3) when moist; few, fine, distinct mottles of yellowish brown; moderate, fine, subangular blocky structure; very hard when dry, very firm when moist; many strongly and weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C—30 to 42 inches, very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) when moist; few, fine, distinct mottles of yellowish brown; weak subangular blocky structure; very hard when dry, very firm when moist; about 40 percent, by volume, consists of powdery masses, chalky fragments, and weakly to strongly cemented nodules of calcium carbonate; calcareous; moderately alkaline; abrupt boundary.

R—42 to 50 inches +, alternating beds of chalky limestone and clayey marl; calcareous; moderately alkaline.

The A horizon ranges from 10 to 20 inches in thickness. This horizon, when dry, ranges from grayish brown to dark grayish brown and has value of 4 or 5, chroma of 1.5 and 2.5, and hue of 10YR or 2.5Y. When moist, the A horizon ranges from 2 to less than 3.5 in value.

The B2 horizon ranges from 10 to 20 inches in thickness. When dry, this horizon ranges from light brownish gray and pale brown to light yellowish brown and brown in a hue of 10YR or 2.5Y.

The C horizon ranges from 10 to 20 inches in thickness. Visible calcium carbonate makes up about 30 to 60 percent of the C horizon. Depth to the R layer ranges from 30 to 60 inches.

The Austin soils occur with the Altoga, Eddy, Stephen, Lewisville, and Houston Black soils. Austin soils have a darker colored and typically a thicker surface layer than that of Altoga soils, and they are darker throughout and are deeper than the Eddy soils. Austin soils have a thicker solum than that of the Eddy or the Stephen soils. The Austin soils are over clayey marl or chalky limestone, whereas the Lewisville soils are over alluvial material. Austin soils are browner and are more permeable than the clayey Houston Black soils.

Austin silty clay, 1 to 3 percent slopes (AuB).—This soil occurs throughout the county on convex knolls and ridges. The soil areas are irregular in shape and average about 25 acres in size. The average slope is about 2 percent.

This soil has a slightly thicker solum than that of the profile described as typical for the series. The surface layer consists of dark grayish-brown silty clay about 18 inches thick. The subsoil is very firm, calcareous silty clay that is light brownish gray in the upper part and pale brown in the lower part. It is underlain by very pale brown silty clay that is about 40 percent calcium carbonate, by volume. At a depth of about 50 inches are alternating beds of chalky limestone and clayey marl.

Included with this soil in mapping were areas of very shallow Eddy gravelly clay loam, moderately deep Stephen silty clay, and deep Houston Black clay. The included areas make up less than 6 percent of any area mapped.

This Austin soil has moderate surface runoff and is susceptible to moderate water erosion in the more sloping areas. Permeability is moderately slow, and available water capacity is moderate.

About 70 percent of this soil is cultivated; the rest is used for pasture and hay. Small grains and grain sorghum are the main crops. Cultivated crops grow moderately well. Contour farming and field terraces help to control water erosion in most cultivated areas. Grassed waterways and diversion terraces help to protect this soil from runoff. (Capability unit IIe–3; pasture and hayland group D)

Austin silty clay, 3 to 5 percent slopes, eroded (AuC2).—This sloping soil is eroded and occupies irregular areas leading to the natural drainageways throughout the county. The areas range from 4 to 80 acres in size. In some places shallow gullies have been cut, but these are easily crossed by farm machines. Slopes are convex and average about 4 percent. The profile of this soil is the one described as representative for the Austin series.

Included with this soil in mapping were areas of very shallow Eddy gravelly clay loam, moderately deep Stephen silty clay, and deep Houston Black clay. The included areas make up less than 8 percent of any area mapped.

Surface runoff is moderately rapid, and the hazard of water erosion is moderately severe. Available water capacity is moderate. Permeability is moderately slow.

About half of this soil is cultivated, mainly to small grains and grain sorghum. Crops grow moderately well. The chief pasture plants are johnsongrass and common and Coastal bermudagrasses. Terraces and contour farming are needed in cultivated areas to protect the soil against water erosion. In some areas grassed waterways and diversion terraces help to control runoff water. (Capability unit IIIe–5; pasture and hayland group E)

Austin silty clay, 5 to 8 percent slopes, eroded (AuD2).—This sloping eroded soil occupies areas that lead to the natural drains throughout the county. The areas are irregular in shape and range from 4 to 7 acres in size. Slopes are convex and average about 7 percent. Some areas are cut by rills and shallow gullies, but they can easily be crossed by farm machinery. The subsoil is exposed at the surface in a few places.

This soil has a thinner solum than that of the profile described as typical for the Austin series. The surface layer is dark grayish-brown silty clay about 12 inches thick. The subsoil is pale-brown silty clay about 10 inches thick. The substratum is very pale brown silty clay, of which about 50 percent, by volume, is visible calcium carbonate. Depth to the alternating beds of chalky limestone and clayey marl is about 32 inches. The profile of this soil is calcareous throughout.

Included with this soil in mapping were small areas of very shallow Eddy gravelly clay loam, moderately deep Stephen silty clay, and deep Altoga silty clay. The included areas make up less than 10 percent of any area mapped.

Surface runoff is rapid, and water erosion is a severe hazard in unprotected areas. Permeability is moderately slow. Available water capacity is moderate.

A few areas are cultivated, but most of this soil is in pasture. Small grains are grown in most cultivated areas. Crops grow moderately well. King Ranch bluestem and common and Coastal bermudagrasses are the main pasture grasses. Contour farming and terraces are needed in cultivated areas to help control water erosion. Grassed waterways and diversion terraces protect this soil against runoff. (Capability unit IVe-3; pasture and hayland group E)

Burleson Series

In the Burleson series are deep, nearly level to moderately sloping clays that have a crusty surface when they are dry. These soils occupy uplands, mainly along the east and west boundaries of the county. They also occupy old alluvial terraces along the major streams.

In the center of a microdepression in a cultivated field, the surface layer (A horizon) of this soil is dark-gray, noncalcareous clay 33 inches thick. This layer grades gradually to gray clay that is faintly mottled with yellowish brown and olive brown. The underlying material begins at a depth of 54 inches and is light olive-brown clay that is faintly mottled with dark grayish brown.

Gilgai microrelief is common on the Burleson soils. When these soils are dry, they crack to a depth of more than 30 inches and crusts as much as 1/16 to 1/2 inch thick form on the surface (fig. 7). When these soils are wet, the cracks close, and water movement into the soils is very slow. Available water capacity is moderate.

Most of the acreage is cultivated, and the rest is used for pasture and hay. The main crops are cotton, corn, small grains, and grain sorghum. Crop growth is moderate to moderately good.

Representative profile of a Burleson clay in a microdepression that has been partly obliterated by cultivation (in a field, 150 feet east of county line road, from a point 0.3 mile north of the intersection of this road and Farm Road 455; this point is about 5.6 miles northwest of the intersection of Farm Road 455 and Texas Highway 289 in Celina):

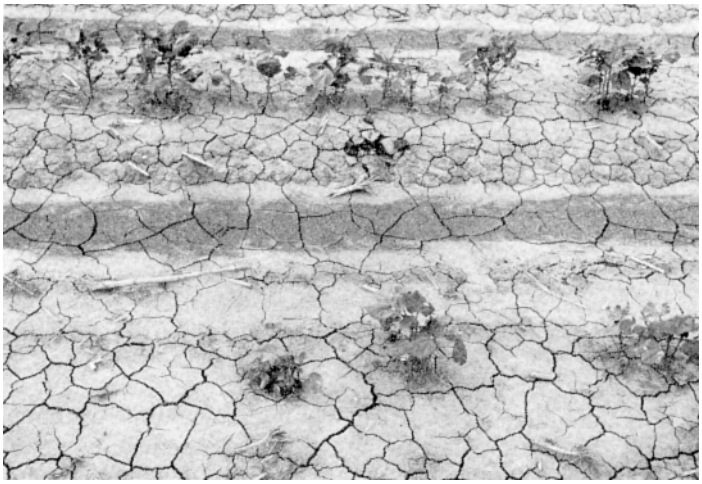

Figure 7.—**Surface crusting on Burleson clay, 0 to 1 percent slopes, in a field of young cotton.**

Ap—0 to 6 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; surface has a light-gray (10YR 6/1) silty clay crust about one-fourth inch thick; weak angular blocky structure; extremely hard when dry, very firm when moist, very sticky and very plastic when wet; medium acid; noncalcareous; abrupt, smooth boundary.

A11—6 to 22 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak angular blocky structure; aggregates have shiny pressure faces; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; few fine pores; noncalcareous; slightly acid; diffuse boundary.

A12—22 to 33 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; common number of wedge-shaped peds that have shiny surfaces; few slickensides that have grooved surfaces; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; noncalcareous; neutral; diffuse boundary.

AC—33 to 54 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; common, fine, faint, yellowish-brown and olive-brown mottles and few spots of darker gray clay in old cracks; parallelepipeds have their long axis tilted more than 10 degrees from the horizontal; distinct, grooved slickensides that intersect; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; about 2 percent, by volume, is small, weakly and strongly cemented concretions of visible calcium carbonate; soil mass noncalcareous; mildly alkaline; diffuse boundary.

C—54 to 75 inches +, light olive-brown (2.5Y 5/4) clay; common, fine, faint, dark grayish-brown mottles; weak blocky structure; extremely hard when dry, extremely firm when moist; about 3 percent, by volume, is small, weakly and strongly cemented concretions of visible calcium carbonate; mildly alkaline; soil mass noncalcareous.

Within a distance of about 6 to 12 feet, the thickness of the A horizon ranges from 12 to 20 inches in the center of the microknoll to about 24 to 60 inches in the center of the microdepression. In undisturbed areas the microknolls are about 8 to 16 inches higher than in the microdepressions. When dry, the A horizon ranges from dark gray to very dark gray in hue of 10YR or 2.5Y, value of 3 or 4, and chroma of less than 1.5. When the A horizon is moist, the value ranges from 2 to less than 3.5. Clay content of the A horizon ranges from about 40 to 60 percent.

The AC horizon ranges from 12 to 30 inches in thickness. When dry, the AC horizon has colors similar to those in the A horizon except for the matrix. In the matrix, the value ranges from 4 to 6 and the croma from 1 to 2. Darker colored clay from the A horizon is in many cracks in the AC horizon. The

faint, brownish mottles in the AC and C horizons are inherited from the parent clay and are not from wetness. Concretions of visible calcium carbonate in the AC and C horizons range from less than 1 to about 5 percent, by volume.

Burleson soils are near the Houston Black, Hunt, and Wilson soils. Burleson soils are crusty on the surface and are slightly less permeable than the Houston Black soils. They have less lime than Hunt soils, which are calcareous below a depth of about 20 inches. The Burleson soils have a more clayey surface layer than the Wilson soils but do not have the dense clay B2t horizon that is characteristic of Wilson soils.

Burleson clay, 0 to 1 percent slopes (BcA).—This soil occurs on alluvial terraces along the streams in the eastern part of the county and on uplands along the east and west boundaries of the county. The soil areas are oval and range from 10 to 350 acres in size. A crust about one-fourth inch thick forms on the surface after a rain.

The profile of this soil is the one described as typical for the Burleson series. In the center of a microdepression, the surface layer is dark-gray, noncalcareous clay about 42 inches thick. Below this layer is gray, noncalcareous clay that is extremely firm when moist. Light olive-brown clay is at a depth of about 70 inches.

Included with this soil in mapping were areas of Hunt clay, Houston Black clay, and Wilson clay loam less than 4 acres in size. The included areas make up less than 5 percent of any area mapped.

Cultivated crops grow moderately well, for surface drainage is slow but adequate, and available water capacity is moderate. Most of this soil is cultivated, chiefly to cotton, corn, small grains, and grain sorghum. The rest is used for pasture and hay. Grassed waterways help to control runoff and water erosion. (Capability unit IIs–6; pasture and hayland group A)

Burleson clay, 1 to 3 percent slopes (BcB).—This soil is on stream terraces in the eastern part of the county and on uplands along the east and west boundaries of the county. The soil areas are irregular in shape and range from 5 to 200 acres in size. Slopes are slightly convex and average about 2 percent. A crust about one-fourth inch thick forms on the surface after a rain. The profile of this soil is similar to the one described as typical for the Burleson series.

Included with this soil in mapping were areas of Houston Black clay, Hunt clay, and Wilson clay loam. The included areas make up less than 8 percent of any area mapped.

Surface runoff, available water capacity, and the hazard of water erosion are moderate. This soil is desirable for farming, and about 70 percent of the acreage is cultivated. The rest is used for pasture and hay. Cotton, small grains, and grain sorghum are the main crops. Cultivated crops are moderately well suited. In cultivated fields terraces and contour farming can be used to control water erosion. In other areas grassed waterways and diversion terraces help to protect this soil. (Capability unit IIIe–1; pasture and hayland group A)

Burleson clay, 2 to 4 percent slopes, eroded (BcB2).—This gently sloping to moderately sloping, eroded soil occupies uplands, mainly along the east and west boundaries of the county. The areas are irregular in shape and range from 5 to 50 acres in size. Slopes average about 3 percent. A crust about one-eighth inch thick forms on the surface after a rain. The surface layer is so eroded that a few broad, shallow gullies and many rills are cut. The gullies can be crossed by farm machinery, but they are too large to be smoothed by cultivation.

This soil has a thinner solum than the one in the profile described as typical for the Burleson series. In the center of a microdepression, the surface layer consists of about 24 inches of dark-gray, noncalcareous clay. Below this layer is gray clay that is extremely firm when moist. Light-brown clay is at a depth of about 40 inches.

Included with this soil in mapping were areas of eroded, calcareous Houston Black clay. The included areas make up less than 10 percent of any area mapped.

Available water capacity is moderate, surface runoff is moderately rapid, and the hazard of water erosion is moderately severe.

About half of the acreage is used for crops, mainly small grains, grain sorghum, sweetclover, peas, and vetch. The rest is used for pasture. In most years crops grow moderately well. Terraces and contour farming are needed in cultivated fields to help control water erosion. Grassed waterways and diversion terraces help to reduce erosion caused by runoff from other areas. (Capability unit IVe–5; pasture and hayland group B)

Crockett Series

The Crockett series consists of gently sloping to sloping, noncalcareous crusty soils that have a subsoil of blocky clay. These soils are eroded and occupy uplands throughout the county.

In a typical profile, the surface layer is grayish-brown, noncalcareous light clay loam about 6 inches thick. The subsoil extends to a depth of about 42 inches. It is grayish-brown clay mottled with yellowish red and strong brown in the upper part and is mottled light brownish-gray and yellowish-brown clay in the lower part. The substratum, to a depth of 42 inches or more, is light brownish-gray clay.

When these soils are dry, crusts ⅛ to 1 inch thick form on the surface and the soils crack to a depth of at least 20 inches. When these soils are wet, the cracks close, and water movement into the soils is very slow. Water erosion is moderate to severe. Available water capacity is low.

Most of the acreage of Crockett soils is pasture. Some areas are in cultivated crops, but native grass is a better use. Small grains are well suited in a few areas.

Representative profile of a Crockett clay loam (in a cultivated field, 80 feet north of county road, from a point 0.4 mile east and 0.5 mile north of the intersection of the county road and a gravel road; point is also 1.3 miles east of the intersection of the county road and Texas Highway 78 and is about 7.6 miles north of the intersection of Texas Highway 78 and Farm Road 2194 in Farmersville):

Ap—0 to 6 inches, grayish-brown (10YR 5/2) light clay loam, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure that crushes easily to weak granular structure; surface crust one-half inch thick has many grains of fine sand; slightly hard when dry, friable when moist; noncalcareous; abrupt boundary.

B21t—6 to 20 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) when moist; common, medium, distinct mottles of yellowish red and strong brown; moderate, coarse, blocky structure; extremely hard when dry, very firm when moist, very sticky when wet; clay films on peds; noncalcareous; gradual, smooth boundary.

B22t—20 to 42 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) clay, dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) when moist; weak blocky structure; extremely hard when dry, extremely firm when moist, very sticky when wet; clay films on peds; few round iron concretions 2 to 4 millimeters in diameter; noncalcareous; gradual, smooth boundary.

C—42 to 52 inches +, light brownish-gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) when moist; few, medium, distinct mottles of light yellowish brown; weak blocky structure; extremely hard when dry, extremely firm when moist; few round iron concretions 1 to 4 millimeters in diameter; calcareous; about 2 percent, by volume, is small weakly cemented concretions of calcium carbonate.

The A horizon ranges from clay loam or light clay loam to fine sandy loam in texture and from 4 to 8 inches in thickness. This horizon, when dry, ranges from grayish brown to dark grayish brown in hue of 10YR, value of 4 to 6, and chroma of 2. When the A horizon is moist, value ranges from 2 to about 4.

The B2t horizon ranges from 20 to 40 inches in thickness. When dry, it ranges from light brownish gray to reddish brown mottled with yellowish red and strong brown to yellowish brown and olive. The mottles make up 15 to 50 percent of the B2t horizon. Depth to the C horizon ranges from 24 to 48 inches. Content of visible calcium carbonate in the C horizon ranges from 1 to 5 percent.

Crockett soils occur closely with the Burleson, Hunt, and Wilson soils. Crockett soils have a less clayey surface layer than in the Burleson soils and Hunt soils. Their subsoil contains more mottles than that of the Wilson soils.

Crockett soils, 2 to 5 percent slopes, eroded (CrC2).—These gently sloping to moderately sloping soils are in uplands throughout the county. The soil areas are irregular in shape and average about 20 acres in size, but some are as large as 80 acres. In a few places, the surface layer is so eroded that the subsoil is exposed. A crust about one-fourth inch thick forms on the surface after a rain. Gullied areas are common, though gullies can be crossed by farm machines.

Except that the surface layer varies in texture, Crockett soils have a profile similar to the one described as typical for the series. The surface layer ranges from light clay loam to fine sandy loam. Commonly, it is grayish-brown, noncalcareous light clay loam about 6 inches thick. Underlying the surface layer is dense, brownish clay mottled with yellowish red and yellowish brown. Calcareous, light brownish-gray clay is at a depth of about 42 inches.

Included with this soil in mapping were areas of Burleson clay, Hunt clay, and Wilson clay loam. The included areas make up less than 8 percent of any area mapped.

In more sloping areas of these soils, the hazard of water erosion is moderately severe. Surface runoff is moderately rapid. Available water capacity is low.

Most of the acreage is pasture, mainly bermudagrass, King Ranch bluestem, and johnsongrass. A few small areas are cultivated. In these areas small grains are well suited. Diversion terraces and grassed waterways are needed for protection against runoff. Contour farming and terraces are needed for controlling water erosion in cultivated fields. (Capability unit IVe–5; pasture and hayland group B)

Crockett soils, 5 to 8 percent slopes, eroded (CrD2).—This mapping unit is eroded and occurs in uplands throughout the county. The soil areas are irregular in shape and range from 15 to 70 acres in size. In many places the original surface layer has been lost through erosion, and the subsoil is exposed. Although gullied areas are common, most gullies can be crossed by farm machines. A crust about one-eighth inch thick forms on the surface after a rain.

This mapping unit has a thinner solum than the one in the profile described as typical for the Crockett series. The surface layer ranges from light clay loam to fine sandy loam. In many places it is noncalcareous light clay loam 4 inches thick. The subsoil is brownish dense clay mottled with yellowish red and yellowish brown. Calcareous, light brownish-gray clay is at a depth of about 30 inches.

Almost all the acreage in this mapping unit is used for pasture. Cultivated crops are not suited, for surface runoff is rapid, the hazard of water erosion is severe, and available water capacity is low. The native vegetation is chiefly little bluestem, sideoats grama, and buffalograss. (Capability unit VIe–1; pasture and hayland group B)

Eddy Series

The Eddy series consists of very shallow, calcareous, loamy soils that are underlain by chalky limestone. These soils are gently sloping to sloping. They occur on uplands, mainly in the western part of the county.

In a typical profile, the surface layer is grayish-brown gravelly clay loam containing strongly cemented, platy fragments of chalk that make up 20 percent of the layer, by volume. This layer is 5 inches thick, and it is underlain by a layer, also 5 inches thick, that is whitish, platy chalk with grayish-brown clay loam between the plates of chalk. The chalk makes up 60 percent of the top inch of this layer and 99 percent of the lower part. The underlying layer is chalky limestone.

Drainage is good, but these soils are low in available water capacity. Water erosion is severe in unprotected areas.

Most of the acreage of Eddy soils is used for pasture. Small grains are the main crops, but they do not grow well. Some areas of Eddy soils are good sites for rock quarries (fig. 8). The chalky limestone in the substratum is a good source of material for road surfaces and subgrades.

Figure 8.—**Rock quarry in an area of Eddy gravelly clay loam, 3 to 8 percent slopes, eroded.**

Representative profile of an Eddy gravelly clay loam (in a native pasture, 400 feet north of center line of Texas Highway 121, from a point 1.3 miles west of the intersection of this highway and Texas Highway 289, about 14 miles southwest of the intersection of Texas Highway 121 and Texas Highway 24 in McKinney):

A1—0 to 5 inches, grayish-brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) when moist; strong, fine, granular structure; slightly hard when dry, firm when moist; about 20 percent, by volume, is strongly cemented platy fragments of chalk; soil mass calcareous; moderately alkaline; abrupt, irregular boundary.

R&A1—5 to 10 inches, whitish chalk; grayish-brown clay loam in the interstices between the plates of chalk is about 10 percent, by volume; chalk content ranges from about 60 percent in the upper inch to about 99 percent in the lower part; some roots in the interstices; calcareous; moderately alkaline; abrupt boundary.

R—10 to 30 inches +, chalky limestone, weakly cemented in upper part, strongly cemented in lower part; consists of whitish chalk that has a hardness of less than 3 (Mohs' scale); calcareous; moderately alkaline.

The A horizon ranges from gravelly clay loam to clay loam in texture and from 3 to 8 inches in thickness. Clay content ranges from about 25 to 35 percent. When dry, the A horizon ranges from dark grayish brown to grayish brown and has value of 3 to 5, chroma of 2 to 4, and hue of 7.5YR or 10YR. When moist, the A horizon has value of less than 3.5 when less than 4 inches thick. The content of chalk fragments in the A horizon ranges from 0 to 50 percent, by volume. The R&A1 layer of whitish chalk occurs in most places. In this layer the amount of soil ranges from about 2 to 15 percent. Depth to the R layer of chalky limestone ranges from 3 to 20 inches. In the chalky limestone the hardness is about 1 to 3 (Mohs' scale).

Eddy soils occur closely with the Austin and Stephen soils. Eddy soils are shallower over chalky limestone than the Austin or Stephen soils.

Eddy gravelly clay loam, 1 to 3 percent slopes (EdB).—Most of this soil is in areas that slope to the natural drains in the county, but a few areas are on low ridgetops. These areas have slightly convex surfaces. They are irregular, are 3 to 25 acres in size, and are mainly in the western part of the county. Slopes average about 2 percent. The profile of this soil is the one described as typical for the Eddy series.

Included with this soil in mapping were areas of moderately deep Stephen silty clay, deep Austin silty clay, and deep Houston clay. The included areas cover less than 8 percent of any area mapped.

Surface runoff is medium, and available water capacity is low.

Much of this soil is in pasture. Cultivated areas are generally within areas of deeper, arable soils. Small grains are the chief crops, but growth of crops is poor. Terraces are not suitable for controlling water erosion, because rock is near the surface. (Capability unit IVs–1; pasture and hayland group H)

Eddy gravelly clay loam, 3 to 8 percent slopes, eroded (EdD2).—This soil is on uplands, mainly in the western part of the county. It occurs on convex ridges and knobs and in areas that slope to the natural drains. Soil areas are irregular in shape and have an average slope of about 5 percent. The average size of these areas is about 80 acres, but some areas are as large as 180 acres.

The solum of this soil is thinner than the one described as typical for the Eddy series. The surface layer consists of gravelly clay loam and free lime and is about 4 inches thick. Many small fragments of chalk are scattered on the surface and throughout the surface layer. Beneath the surface layer is a mixture that is about 95 percent whitish chalk and about 5 percent grayish-brown clay loam. It is underlain by chalky limestone.

Included with this soil in mapping were areas of eroded Stephen silty clay and Austin silty clay. Also included, in the southern part of the county, were a few outcrops of sandstone. The included areas make up less than 10 percent of any area mapped.

Cultivated crops generally are not suited, because water erosion is severe, surface runoff is rapid, and available water capacity is low. This soil is used mainly for pasture; the native grasses are mainly bluestems and grama grasses. In most years stands of grass are thin. (Capability unit VIe–2; pasture and hayland group H)

Ellis Series

The Ellis series consists of moderately sloping to sloping clays that formed over dark-gray shale. These soils are on uplands, mainly in the western part of the county.

In a typical profile, the upper 12 inches is dark grayish-brown, noncalcareous clay. It is underlain by olive-gray clay that is extremely firm when moist and extends to a depth of about 22 inches. The next layer is gray, extremely firm clay. Compact shale is at a depth of 32 inches.

When these soils are dry, cracks commonly extend to a depth of at least 20 inches. Water enters the cracks rapidly. When the soils are wet, the cracks close and the movement of water into the soils is very slow. The hazard of water erosion is moderately severe. Surface runoff is rapid.

Most fields of the Ellis soils that were farmed to cotton and small grains are now used for pasture. The few remaining cultivated fields require intensive management, including fertilization. The pastures consist of thin stands of native grasses and are weedy. Crops do not grow well.

Representative profile of an Ellis clay (in a cultivated field 80 feet south of a gravel road, from a point 1.5 miles west of the intersection of the gravel road and Farm Road 455; about 2.3 miles northwest of the intersection of Farm Road 455 and Texas Highway 289 in Celina):

Ap—0 to 5 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3.5/2) when moist; weak angular blocky structure; very hard when dry, firm when moist; one-half inch surface crust; noncalcareous; abrupt boundary.

A1—5 to 12 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3.5/2) when moist; moderate, fine, angular blocky structure; extremely hard when dry, extremely firm when moist; noncalcareous; gradual, smooth boundary.

AC or B—12 to 22 inches, olive-gray (5Y 5/2) clay, olive gray (5Y 4/2) when moist; few, medium, distinct, yellowish-brown mottles; weak blocky structure; extremely hard when dry, extremely firm when moist; few small crystals of calcium sulfate; soil mass noncalcareous; gradual, smooth boundary.

C—22 to 32 inches, gray (5Y 5/1) clay, gray (5Y 4.5/1) when moist; many, medium, distinct, yellowish-brown mottles; massive; extremely hard when dry, extremely firm when moist; few small crystals of calcium sulfate; few shale fragments; soil mass noncalcareous; abrupt boundary.

R—32 to 34 inches +, dark-gray, compact, blocky shale; noncalcareous.

The A horizon ranges from 9 to 16 inches in thickness, and when dry, it ranges from dark grayish brown to olive in a value of 3 or 4, chroma of 2, 3, or 4, and hue of 10YR, 2.5YR, or 5Y. The A horizon is calcareous in a few places where Ellis soils occur with higher lying, calcareous soils. The AC or B horizon ranges from 8 to 12 inches in thickness. Color ranges from grayish brown to olive in value of 4 or 5, chroma of 2 or 3, and hue of 2.5Y or 5Y.

The C horizon ranges from 8 to 12 inches in thickness and in a few places contains weakly to strongly cemented concretions of calcium carbonate. Depth to the R layer of compact shale ranges from 25 to 40 inches.

Ellis soils occur closely with the Houston soils and Ferris soils. Ellis soils are noncalcareous, whereas the Houston and Ferris soils are calcareous and are less dense and permeable in the layer beneath the surface layer.

Ellis clay, 3 to 8 percent slopes, eroded (ElD2).—This moderately sloping to sloping soil is mainly in the western part of the county. It is in irregularly shaped areas that average about 60 acres in size. Slopes average about 6 percent. The surface layer is commonly eroded, and many gullies are cut. The profile of this soil is the one described as typical for the Ellis series.

Included with this soil in mapping were areas of Ferris-Houston clays, 5 to 12 percent slopes, severely eroded. The included areas make up less than 5 percent of any area mapped.

Surface runoff is rapid. In sloping areas, the hazard of water erosion is moderately severe.

Most of the fields were once cultivated to cotton and small grains but are now used for pasture. The rest of the cultivated fields need intense management, though crops do not grow well, even if they are well managed. Stands of native grass are thin and weedy. Terraces, contour farming, and grassed waterways are needed in cultivated areas so as to help control water erosion. Cultivated crops need additions of fertilizer. (Capability unit IVe–2; pasture and hayland group H)

Engle Series

The Engle series consists of calcareous, loamy soils that are gently sloping to moderately sloping. These soils formed in material derived from weakly cemented sandstone. They occupy uplands, mainly in the eastern part of the county.

In a typical profile, the surface layer is dark grayish-brown, calcareous clay loam about 18 inches thick. The subsoil is light brownish-gray, calcareous clay loam about 14 inches thick. It is underlain by very pale brown clay loam.

Permeability, available water capacity, and natural fertility are moderate. Water erosion is moderate to moderately severe.

The Engle soils are farmed to small grains and grain sorghum. Some less fertile areas are used for pasture and hay.

Profile of an Engle clay loam (in a pasture, 100 feet west of county road, from a point 0.5 mile south of the intersection of the county road and a gravel road; point is also 0.6 mile west and 0.8 mile south of the intersection of the county road and Texas Highway 24 and is about 0.7 mile west of the intersection of Texas Highway 24 and Texas Highway 78 in Farmersville):

A11—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky and moderate, fine, granular structure; slightly hard when dry, friable when moist; few root channels; few small concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—6 to 18 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist; few root channels; few soft masses of segregated calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B—18 to 32 inches, light brownish-gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; few weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—32 to 48 inches +, very pale brown (10YR 8/3) clay loam, pale brown (10YR 6/3) when moist; common, medium, distinct mottles of brownish yellow; weak subangular blocky structure; hard when dry, firm when moist; many soft masses of segregated calcium carbonate in upper part; thin strata of sandstone weakly cemented with calcium carbonate in lower part; calcareous; moderately alkaline.

The A horizon ranges from 12 to 20 inches in thickness and from loam to heavy clay loam in texture. When dry, this horizon ranges from dark grayish brown to dark brown in hue of 10YR, value of 3 to 5, and chroma of 2 or 3. When the A horizon is moist, value ranges from 2 to less than 3.5.

The B horizon ranges from 8 to 20 inches in thickness. When dry, it ranges from light brownish gray to brown in hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Clay content of the B horizon ranges from 20 to about 35 percent.

The mottles in the C horizon have a chroma of more than 2, or they do not indicate wetness. Depth to the weakly cemented, calcareous sandstone ranges from 30 to 50 inches.

The Engle soils are near the Austin, Houston, Houston Black, and Lamar soils. Engle soils are more sandy than the Austin soils and are less clayey than the Houston or Houston Black soils. They have a thicker surface layer than the Lamar soils and are less sloping and eroded.

Engle clay loam, 1 to 3 percent slopes (EnB).—This gently sloping soil is on uplands, mainly in the eastern part of the county. The areas are oval and average about 50 acres in size. The profile of this soil is the one described as typical for the Engle series.

Included with this soil in mapping were areas of Austin silty clay, Houston clay, and Houston Black clay 2 to 3 acres in size. These inclusions make up less than 5 percent of any area mapped.

In the sloping areas, water erosion is moderate. Available water capacity, surface runoff, and permeability are moderate.

About 60 percent of this soil is cultivated; the rest is used for pasture and hay. Field crops are moderately well suited. Small grains and grain sorghum are the main crops. In cultivated fields terraces and contour farming help to control water erosion. Grassed waterways and diversion terraces are needed for protection against runoff. (Capability unit IIe–3; pasture and hayland group D)

Engle clay loam, 3 to 5 percent slopes, eroded (EnC2).—This eroded soil occupies uplands, mainly in the eastern part of the county. The areas are oval and average about 40 acres in size, though one area is as large as 100 acres. The surface is eroded and has a few broad, shallow gullies. These gullies can be crossed by farm machines.

This soil has a thinner solum than that in the profile described as typical for the series. The surface layer is dark grayish-brown, calcareous clay loam about 12 inches thick. The subsoil is light brownish-gray, calcareous clay loam. Very pale brown clay loam is at a depth of about 22 inches.

Included with this soil in mapping were areas of eroded Houston clay. The included areas make up less than 6 percent of any area mapped.

In the more sloping fields, the hazard of water erosion is moderately severe. Surface runoff is moderately rapid; permeability and available water capacity are moderate.

About 60 percent of this soil is used for pasture, and the rest is cultivated. Crops, which are mainly small grains and grain sorghum, are moderately well suited. The main pasture grasses are johnsongrass and common or Coastal bermudagrass. In cultivated fields terraces and contour farming are needed to control water erosion. Grassed waterways and diversion terraces are needed to protect the soil from runoff. (Capability unit IIIe–5; pasture and hayland group E)

Ferris Series

The Ferris series consists of deep, calcareous, sloping to strongly sloping clays. These soils occupy uplands, mainly in the eastern part of the county.

In a typical profile, the surface layer is light olive-brown, calcareous clay about 6 inches thick. The next layer is about 24 inches thick, and it consists of light yellowish-brown clay that is faintly mottled with gray and is underlain by mottled light olive-gray and olive-yellow clay. Mottled light-gray and light olive-brown marine clay, or marl, occurs at a depth of 60 inches (fig. 9).

When these soils are dry, they crack to a depth of at least 30 inches. These cracks remain open for more than 90 days in most years. Movement of water into the soils is rapid. When the soils are wet, the cracks close, and movement of water into the soils is very slow. The hazard of water erosion is severe. Surface runoff is rapid.

Most of the acreage of these soils is in abandoned fields where stands of grass are normally thin. A few fields are used for improved pasture.

Representative profile of a Ferris clay (in pasture, 150 feet south of gravel road, from a point 0.4 mile west and 1.4 miles north of the intersection of the gravel road and Farm Road 2194; this is about 2.5 miles northeast of the intersection of Farm Road 2194 and Texas Highway 78 in Farmersville):

A1—0 to 6 inches, light olive-brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) when moist; moderate, fine, angular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; few, fine, strongly cemented concretions of calcium carbonate about 1 to 2 millimeters in diameter; calcareous; moderately alkaline; gradual boundary.

AC1—6 to 30 inches, light yellowish-brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) when moist; few, fine, distinct mottles of gray; few parallelepipeds in lower part; aggregates have shiny pressure faces; lower part contains distinct, grooved slickensides that intersect; very hard when dry, very firm when moist, very sticky and very plastic when wet; many weakly cemented concretions of calcium carbonate as much as 15 millimeters in diameter; calcareous,; moderately alkaline; diffuse boundary.

AC2—30 to 60 inches, mottled light olive-gray (5Y 6/2) and olive-yellow (2.5Y 6/8) clay, olive gray (5Y 5/2) and light olive brown (2.5Y 5/6) when moist; distinct parallelepipeds that have axes tilted more than 10 degrees from the horizontal; distinct, grooved slickensides; very hard when dry, very firm when moist, very sticky and very plastic when wet; many soft masses of calcium carbonate 2 to 8 millimeters in diameter; calcareous; moderately alkaline; diffuse boundary.

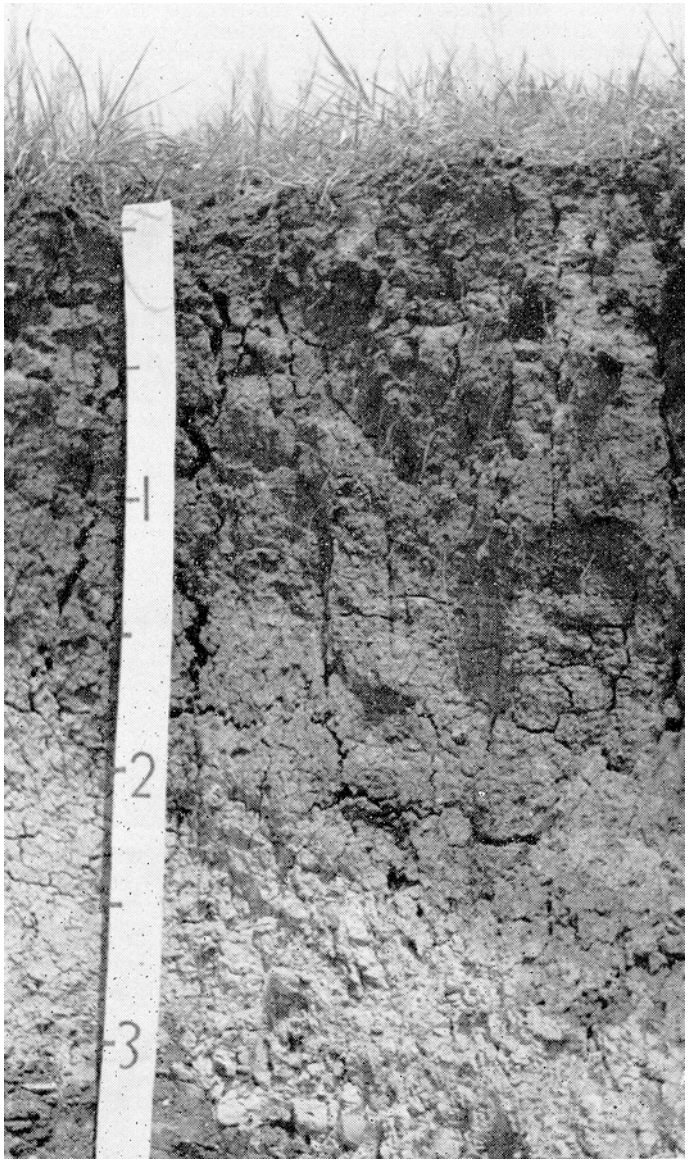

Figure 9.—**Profile of Ferris clay. The C horizon of clayey marl is at a depth of 2 feet.**

C—60 to 70 inches +, mottled light-gray (2.5Y 7/2) and light olive-brown (2.5Y 5/6) marine clay or marl; massive; weak horizontal cleavage; very hard when dry, very firm when moist, very sticky and very plastic when wet; few weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 3 to about 10 inches in thickness and from silty clay to clay in texture. Clay content ranges from 45 to 60 percent. When the A horizon is dry, it ranges from grayish brown to olive in hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 and chroma of 2 to 4. Where this horizon is moist and has value of less than 3.5, it is less than 10 inches thick. The A horizon, when moist or dry, has chroma of more than 1.5. The AC1 horizon ranges from 12 to 30 inches in thickness. When it is dry, its colors are similiar to those of the A horizon, except that the value ranges from 4 to 6.

The mottles in the AC and C horizons vary considerably from place to place. They are not related to natural drainage but are inherited from the parent marl. Content of calcium carbonate equivalent is mostly 10 to 35 percent throughout the soil, but in some places it is as low as 2 percent.

Ferris soils occur closely with the Houston and Ellis soils. The surface layer of Ferris soils is thinner than that of the Houston soils, and the next layer is less dense than the corresponding layer in Ellis soils.

Ferris-Houston clays, 5 to 12 percent slopes, severely eroded (FeE3).—This complex consists of sloping to strongly sloping soils in the rolling areas, mainly in the vicinity of Farmersville. The areas range from 5 to 170 acres in size. Most of these areas are cut by many natural drains. Many areas are deeply gullied (fig. 10).

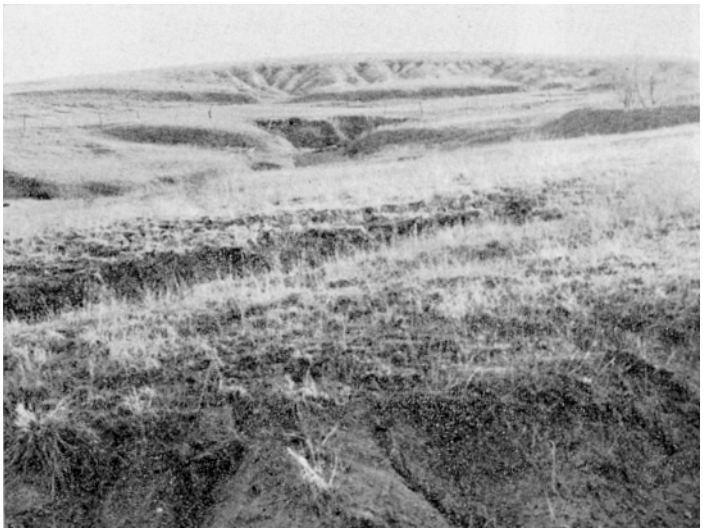

Figure 10.—**Rolling topography of Ferris-Houston clays, 5 to 12 percent slopes, severely eroded. Gullied areas are common.**

The Ferris soil is in the more sloping and eroded parts of the areas that lead to the natural drains. The Houston soil is on the ridgetops and in other less sloping parts.

In this complex Ferris clay makes up about 70 percent of the acreage; Houston clay, 25 percent; and other soils, 5 percent. The soils are mapped as a complex because they are so intermingled that they could not be shown separately on a map of the scale used.

The Ferris soil has the profile described as typical for the Ferris series.

The Houston soil in this complex has a profile similar to the one described as typical for the series. The surface layer is dark grayish-brown, very firm clay about 16 inches thick. It grades gradually to grayish-brown or light brownish-gray, extremely firm clay.

Included with these soils in mapping were eroded areas of Lamar clay loam. The included areas, totaling less than 8 percent, are 3 to 4 acres in size.

Cultivated crops are not suited, because the surface layer of the Ferris soil is thin, and it is low in organic-matter content. Also, surface runoff is rapid on the Houston soil, and crop growth is moderately poor. In sloping areas water erosion is severe.

Most of the acreage is in abandoned fields, but the vegetative cover is thin. A few fields are used for improved pasture. Bluestems and three-awns are the main native grasses. (Capability unit VIe–2; pasture and hayland group I)

Frio Series

The Frio series consists of deep, friable, loamy soils. These soils occupy flood plains along the major streams and their tributaries, mainly in the eastern part of the county. Slopes are less than 1 percent.

In cultivated areas, the plow layer of a typical profile is dark grayish-brown, friable clay loam about 6 inches thick. It is underlain by dark grayish-brown heavy clay loam that contains lime and extends to a depth of about 20 inches. The next layer to a depth of 55 inches or more is grayish-brown heavy clay loam.

The Frio soils are moderately permeable. Available water capacity and natural fertility are high.

Cultivated areas of these soils are farmed to cotton, corn, small grains, and grain sorghum. Pasture and hay are grown in fields where frequent flooding is likely.

Representative profile of a Frio clay loam (in a cultivated field, 100 feet south of gravel road, from a point 0.4 mile east of the intersection of the gravel road and Farm Road 1827; the point is also 6.0 miles northeast of the intersection of the gravel road and Texas Highway 24 and is about 2.3 miles southeast of the intersection of Texas Highway 24 and U.S. Highway 75 in McKinney):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak granular structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 20 inches, dark grayish-brown (10YR 4/2) heavy clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky and moderate, medium, granular structure; slightly hard when dry, friable when moist; few worm casts; few, small, strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual boundary.

C—20 to 55 inches +, grayish-brown (10YR 5/2) heavy clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; many threads and films and small strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 10 to 20 inches in thickness and from clay loam to heavy silty clay loam in texture. When dry, this horizon ranges from grayish brown to very dark grayish brown in hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1.5 to 3. When moist, the A horizon ranges from 2 to less than 3.5 in value. The content of clay between depths of 10 and 40 inches ranges from about 35 to 45 percent. In some places the C horizon is stratified with layers of sand or silt. In some areas the C horizon overlies beds of gravel at a depth of 8 to 10 feet.

Frio soils occur with the Trinity soils, but they are lighter colored and less clayey.

Frio clay loam, frequently flooded (0 to 1 percent slopes) (Ff).—This nearly level soil occupies flood plains along the major streams and their tributaries, mainly in the eastern part of the county. The soil areas are oblong and average about 60 acres in size. The surface is uneven and, in a few places, is cut by partly filled old stream channels in which water stands for short periods after rains. Frequent flooding is likely. After each flood, litter is scattered over the surface.

This soil has a slightly thicker surface layer than the one in the profile described as typical for the Frio series. The surface layer is dark grayish-brown, friable clay loam about 22 inches thick. It contains free lime. Underlying the surface layer is grayish-brown heavy clay loam.

Included with this soil in mapping were areas of Trinity clay. The included areas make up less than 8 percent of any area mapped.

Frio clay loam, frequently flooded, is moderately permeable. Surface runoff is very slow.

Most of this soil is used for pasture and hay. Flooding is so frequent that cultivated crops are not suitable. Some areas are subject to washing, and soil material deposited in fields during floods is damaging. Wooded areas along the streams are suitable wildlife habitats. Common and Coastal bermudagrasses, johnsongrass, and dallisgrass are well suited. In areas where the surface is even, forage crops respond to fertilizer applications. (Capability unit Vw–1; pasture and hayland group J)

Frio clay loam, occasionally flooded (0 to 1 percent slopes) (Fo).—This nearly level soil occupies the flood plains along the major streams and their tributaries, mainly in the eastern part of the county. The soil areas are oblong and average about 70 acres in size. In places the surface is slightly undulating. Slopes average about 0.5 percent. The profile of this soil is the one described as typical for the Frio series.

Included with this soil in mapping were areas of Trinity clay. The included areas make up less than 6 percent of any area mapped.

Frio clay loam, occasionally flooded, has moderate permeability. Available water capacity is high.

Flooding is likely in some years, but the floods generally do not occur during the growing season and crops are not damaged. Cultivated crops generally grow well, and most of this soil is cultivated. Cotton, corn, grain sorghum, and small grains are the main crops. In most areas pasture and hay are suitable. Also, pecan trees generally are productive. Grassed waterways are needed in places to help protect this soil from runoff water from higher areas. Diversion terraces are also helpful. Cultivated crops respond if fertilizer is applied. (Capability unit I–1; pasture and hayland group J)

Houston Series

The Houston series consists of deep, calcareous, clayey soils that are moderately sloping to sloping and eroded. These soils formed in calcareous clays. They are on uplands throughout the county.

In a cultivated field in the center of a microdepression, the surface layer (A horizon) is dark grayish-brown, calcareous clay 16 inches thick. This layer grades gradually to extremely firm, calcareous clay that extends to a depth of 60 inches or more. This layer is grayish brown mottled with yellowish brown in the upper part and is light brownish gray mottled with brownish yellow in the lower part (fig. 11).

Gilgai microrelief is common on the Houston soils, but plowing obliterates most of the microknolls and fills in the small depressions. When these soils are dry, they crack to a depth of more than 30 inches. During each rain, water enters the cracks rapidly. These cracks remain open for a total of 90 to 135 days in a year. The cracks seal after each rain, and water moves into the soils very slowly. Surface runoff is rapid. The hazard of water erosion is moderately severe to severe.

Figure 11.—**Profile of a Houston clay. The wavy lower boundary of the AC horizon is shown.**

Most of these soils are used for pasture. Only a few areas are cultivated. In these areas small grains and grain sorghum are grown, but crop growth is moderate to moderately poor.

In future surveys, soils having characteristics like the Houston soils will be included with another soil series.

Representative profile of a Houston clay in the center of a microdepression that has been partly obliterated by cultivation (in a field 90 feet south of gravel road, from a point 1.5 miles east of the intersection of the gravel road with Farm Road 982; this is about 2.3 miles southeast of the intersection of Farm Road 982 and Texas Highway 24 in Princeton):

Ap—0 to 6 inches, dark grayish-brown (2.5Y 4.5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; weak subangular blocky structure; very hard when dry, very firm when moist, very sticky and very plastic when wet; calcareous; moderately alkaline; abrupt boundary.

A1—6 to 16 inches, dark grayish-brown (2.5Y 4.5/2) clay, very dark grayish brown (2.5Y 3/2) when moist; moderate, fine, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; few small roots and root channels; calcareous; moderately alkaline; diffuse; wavy boundary.

AC1—16 to 34 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5YR 4/2) when moist; few, fine, distinct mottles of yellowish brown; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; aggregates have shiny pressure faces; many, distinct, intersecting, grooved slickensides in the lower part; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; few strongly cemented concretions of calcium carbonate 2 to 5 millimeters in diameter; calcareous; moderately alkaline; diffuse boundary.

AC2—34 to 60 inches +, light brownish-gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) when moist; few, medium, distinct, brownish-yellow mottles; distinct parallelepipeds that have axes tilted more than 10 degrees from the horizontal; distinct, grooved, intersecting slickensides are common but are less noticeable below a depth of 50 inches; extremely hard when dry, extremely firm when moist; films, threads, and many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous in the matrix; moderately alkaline.

Within a linear distance of about 6 to 12 feet, the thickness of the A horizon ranges from 7 inches at the center of the microknoll to 30 inches at the center of the microdepressions. Average thickness of the A horizon is more than 12 inches. In undisturbed areas the microknolls are about 6 to 16 inches higher than the microdepressions. When dry, the A horizon ranges from grayish brown to olive brown in hue of 2.5Y, value of 4 or 5, and chroma of 2 to 4. When the A horizon is moist or dry, chroma is more than 1.5, but when it is moist, value ranges from 1 to less than 3.5.

The AC1 horizon ranges from 12 to 30 inches in thickness. When dry, the AC1 horizon has a color range similar to that of the A horizon, except that value is 1 or 2 units higher and chroma is 1 or 2 units weaker. Throughout the profile the content of visible calcium carbonate ranges from 0 to 30 percent, by volume. In degree and color, mottling in the AC1 and AC2 horizons varies considerably. Mottling seems related to the marine clay from which the soil formed, not to wetness or natural drainage. In a few places over chalk or chalky marl, depth to the AC horizon ranges from 30 to 50 inches.

Houston soils are near the Ferris, Houston Black, Hunt, and Lamar soils. The surface layer of Houston soils is thicker than that of the Ferris soils. Houston soils are steeper than the Houston Black and Hunt soils. They are more clayey throughout the solum than the Lamar soils.

Houston clay, 3 to 5 percent slopes, eroded (HcC2).—This soil occurs throughout the county. It occupies upland areas that slope to the natural drains. The areas are oblong and average about 35 acres in size. A few, broad, shallow gullies occur, but they are easily crossed by farm machines. In a few places erosion has exposed the subsoil. Most of the gilgai microrelief has been obliterated by cultivation or erosion. The profile of this soil is the one described as typical for the series.

Included in mapping were areas of severely eroded Ferris clay, eroded Houston Black clay, and eroded Lamar clay loam. These areas are 1 to 3 acres in size and make up less than 8 percent of any area mapped.

This soil is moderately fertile, but the hazard of water erosion is moderately severe. Surface runoff is rapid.

Most of the acreage is used for pasture, but small grains and grain sorghum are farmed in a few areas. Johnsongrass, King Ranch bluestem, and Coastal bermudagrass are improved pasture grasses grown in most areas. In cultivated fields contour farming and terraces are needed for control of water erosion. Grassed waterways and diversion terraces help to reduce erosion caused by runoff from other areas. (Capability unit IIIe–3; pasture and hayland group C)

Houston clay, 5 to 8 percent slopes, eroded (HcD2).—This sloping soil occurs throughout the county. It is in upland areas that slope to the natural drains. The soil areas are oblong and have an average size of about 25 acres. Erosion has removed much of the surface layer and has exposed the subsoil in some places. A few deep and shallow gullies occur, and most of the deep ones cannot be crossed by farm machines.

This soil has a thinner surface layer than that in the profile described as typical for the series. The surface layer is dark grayish-brown, calcareous clay about 10 inches thick. Below this layer is calcareous clay that is extremely firm when moist. It is grayish brown in the upper part and light brownish gray in the lower part.

Included with this soil in mapping were areas of eroded Ferris clay and eroded Lamar clay loam. These areas are 1 to 4 acres in size, and they make up less than 10 percent of any area mapped.

Surface runoff is rapid, and the hazard of water erosion is severe. Crops do not grow well.

Only a few areas of this soil are cultivated, and the rest is used for pasture. Small grains are the main crops in cultivated areas. The main improved pasture grasses are Coastal bermudagrass and King Ranch bluestem. In cultivated fields terraces and contour farming are needed to help control water erosion.

In some areas grassed waterways and diversion terraces are needed to reduce erosion caused by runoff from other areas. (Capability unit IVe–2; pasture and hayland group C)

Houston Black Series

In the Houston Black series are deep, calcareous, clayey soils that formed in calcareous clay or chalky marl. These soils are nearly level to moderately sloping. They are on uplands throughout the county and are on old alluvial terraces along the major streams in the eastern part.

In the center of a microdepression in a cultivated field, the surface layer (A horizon) is very dark gray, calcareous clay about 44 inches thick. This layer grades gradually to light-gray clay that is distinctly mottled with yellowish brown. The underlying layer, at a depth of 60 inches, is light-gray clay that is prominently mottled with yellowish brown.

Gilgai microrelief is common on the Houston Black soils. When these soils are dry, they crack to a depth of more than 30 inches (fig. 12). Water enters the cracks rapidly until they close. When these soils are wet, the cracks close, and water moves very slowly into the soils.

Most of the acreage is cultivated, and the rest is used for pasture and hay. The main crops are cotton, corn, small grains, and grain sorghum. Crop growth is moderate to moderately good.

Representative profile of a Houston Black clay at the center of a microdepression that is partly obliterated by cultivation (in field 300 feet east of unimproved road, from a point 1.4 miles north of intersection of Farm Road 547 and Farm Road 1778; this is about 1.2 miles north and 1.3 miles west of Josephine):

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak granular structure; surface mulch of fine, discrete, very hard aggregates; very hard when dry, very firm when moist, very sticky and plastic when wet; calcareous; moderately alkaline; abrupt boundary.

A11—6 to 22 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, medium, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; calcareous; moderately alkaline; diffuse, wavy boundary.

A12—22 to 44 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; distinct parallelepipeds that have the long axes tilted more than 10 degrees from the horizontal; common, distinct, grooved slickensides that intersect; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; few, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

AC—44 to 60 inches, light-gray (10YR 7/1) clay, light brownish gray (10YR 6/2) when moist; a few, fine, distinct, yellowish-brown mottles; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; distinct, grooved slickensides that intersect; aggregates have shiny pressure faces; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; many, small, strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; diffuse boundary.

C—60 to 70 inches +, light-gray (2.5Y 7/2) clay, about the same color when moist; many, prominent, yellowish-brown mottles; weak angular blocky structure; extremely hard when dry, extremely firm when moist; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

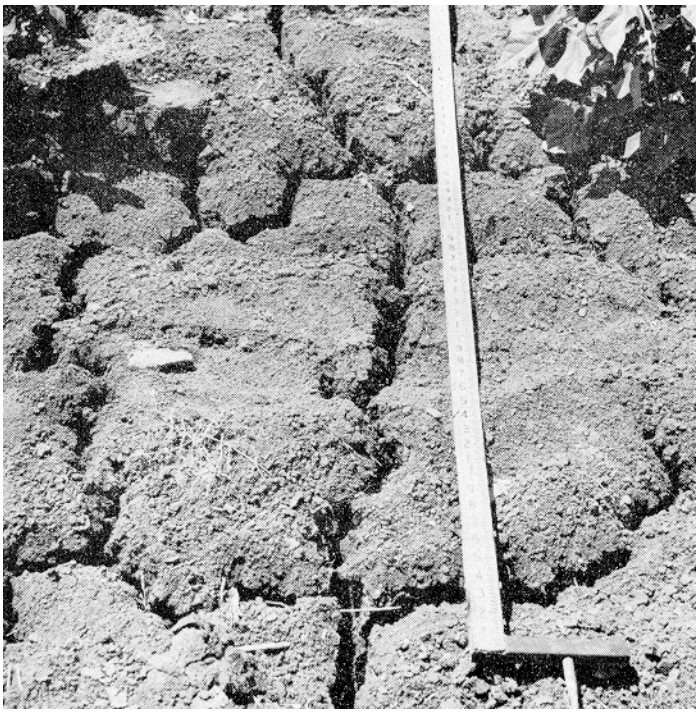

Figure 12.—**Surface of Houston Black clay, 0 to 1 percent slopes, showing wide deep cracks and mulch of fine, discrete, very hard aggregates.**

Representative profile of a Houston Black clay at the center of a microknoll, about 8 feet from the profile at the center of the microdepression:

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak granular structure; surface mulch of fine, discrete, very hard aggregates; very hard when dry, very firm when moist, very sticky and plastic when wet; calcareous; moderately alkaline; abrupt boundary.

A1—6 to 16 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, medium, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky and very plastic when wet; few small concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

AC—16 to 60 inches, light-gray (10YR 7/1) clay, light brownish gray (10YR 6/2) when moist; few, fine, distinct, yellowish-brown mottles; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; distinct, grooved slickensides that intersect; aggregates have shiny pressure faces; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; many, small, strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; diffuse boundary.

C—60 to 70 inches +, light-gray (2.5Y 7/2) clay, about same color when moist; many, prominent, yellowish-brown mottles; weak angular blocky structure; extremely hard when dry, extremely firm when moist; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

Within a distance of about 8 to 12 feet, the thickness of the A horizon ranges from 12 to 22 inches in the center of the microknoll to about 30 to 60 inches in the center of the microdepression. In undisturbed areas, the microknolls are about 8 to 18 inches higher than the microdepressions. When dry, the A horizon ranges from dark gray to very dark gray in hue of 10YR or 2.5Y, value of 3 or 4, and chroma of less than 1.5. When the A horizon is moist, value ranges from 2 to less than 3.5. The content of clay in the A horizon ranges from 50 to 60 percent. In areas where the AC horizon is over clay, it ranges from 12 to 50 inches in thickness, and, when dry, ranges from light gray to olive gray in hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2.

Houston Black soils occur closely with the Austin, Burleson, Engle, Houston, Hunt, and Lewisville soils. The Houston Black soils are darker gray and less permeable than the Austin, Engle, and Lewisville soils. They are slightly more permeable than the crusty Burleson soils and the Hunt soils, which are free of lime in the upper 20 inches of the solum. Houston Black soils have a thicker surface layer, are less sloping, and are darker throughout the solum than the Houston soils.

Houston Black clay, 0 to 1 percent slopes (HoA).—This soil occupies alluvial terraces along the streams in the eastern part of the county and is on uplands throughout the county. The areas are irregular in shape and range from 5 to 100 acres in size. On the surface is a mulch consisting of fine, discrete, very hard aggregates (see figure 12). Gilgai microrelief is common in undisturbed areas. Surface runoff is slow.

This soil has a thicker solum than the one in the profile described as typical for the series. In the center of a microdepression, the surface layer is very dark gray, calcareous clay about 55 inches thick. It is underlain by light-gray, calcareous clay that is extremely firm when moist. Light-gray, calcareous clay is at a depth of about 85 inches.

Included with this soil in mapping were areas of a Hunt clay and a Burleson clay. The included areas make up less than 5 percent of any area mapped.

Crops grow moderately well on this soil. Nearly all the acreage is cultivated, and the rest is used for pasture and hay. Cotton, corn, small grains, and grain sorghum are the

main crops. Fields planted to cotton require intensive management for preventing root rot. Grassed waterways can be used to help to control water erosion and runoff. (Capability unit IIs–6; pasture and hayland group C)

Houston Black clay, 1 to 3 percent slopes (HoB).—This is the most extensive soil in the county. It occupies uplands throughout the county and stream terraces in the eastern part. Most areas are irregular in shape, and they range from 10 to 200 acres in size, but one is as large as 1,000 acres. A few areas are eroded and rilled, but they can be smoothed by cultivation. Surface runoff and the hazard of erosion are moderate. On the surface is a mulch consisting of fine, discrete, very hard aggregates. Gilgai microrelief is apparent in undisturbed areas, but little microrelief can be seen in cultivated areas. The profile of this soil is the one described as typical for the Houston Black series.

Included with this soil in mapping were areas of Austin silty clay, Hunt clay, Burleson clay, and Engle clay loam. These areas are 1 to 3 acres in size, and they make up less than 8 percent of any areas mapped. Also included, in the western part of the county, were a few areas underlain by chalky limestone at a depth of 40 to 60 inches.

Nearly all of the acreage of this soil is cultivated. Some areas are used for pasture and hay. Cotton, corn, small grains, and grain sorghum are the main crops. Cultivated crops are moderately well suited. Fields planted to cotton require intensive management for preventing root rot. In cultivated areas, terraces help to control water erosion. In some areas grassed waterways and diversion terraces help reduce erosion caused by runoff from surrounding soils. (Capability unit IIe–1; pasture and hayland group C)

Houston Black clay, 2 to 4 percent slopes, eroded (HoB2).—This eroded soil occupies uplands throughout the county. The soil areas are irregular in shape and range from 10 to 50 acres in size. Slopes average about 3 percent. On the surface is a mulch consisting of fine, discrete, very hard aggregates. A few broad, shallow gullies and many rills occur. The gullies can be crossed by farm machines, but they are too large to be smoothed by cultivation.

This soil has a thinner solum than the one in the profile described as typical for the Houston Black series. In the center of a microdepression, the surface layer is calcareous clay about 32 inches thick. Below this layer is light-gray, extremely firm, calcareous clay. Light-gray, calcareous clay is also at a depth of about 48 inches.

Included with this soil in mapping were eroded areas of Burleson clay, Engle clay loam, eroded Houston clay, and Lewisville silty clay. The included areas are 1 to 4 acres in size, and they make up less than 10 percent of any area mapped. Also included, in places in the western part of the county, were areas underlain by chalky limestone at a depth of 30 to 60 inches.

Surface runoff is moderately rapid. In sloping areas water erosion is moderately severe.

This soil is moderately well suited to crops. About 65 percent of the acreage is cultivated, and the rest is used for pasture. Small grains and grain sorghum are the main cultivated crops. Coastal bermudagrass is the main improved pasture grass. In cultivated fields terraces and contour farming are needed to help control water erosion. Diversion terraces and grassed waterways help to control water erosion caused by runoff from surrounding soils. (Capability unit IIIe–3; pasture and hayland group C)

Hunt Series

In the Hunt series are deep, nearly level to gently sloping, clayey soils that have free lime below a depth of 20 inches. These soils are on uplands throughout the county.

In the center of a microdepression in a cultivated field, the surface layer (A horizon) is very dark gray clay about 36 inches thick. The upper 20 inches is noncalcareous. The surface layer grades gradually to gray, calcareous clay that is extremely firm when moist. Underlying material occurs at a depth of 46 inches and is mottled gray and light-gray clay.

Gilgai microrelief is common on the Hunt soils (fig. 13). When the soils are dry, they crack to a depth of more than 30 inches. Water enters the cracks rapidly. When these soils are wet, the cracks seal, and water movement is very slow. Available water capacity is moderate. The hazard of erosion is slight to moderate.

Figure 13.—**Gilgai microrelief on the surface of Hunt clay, 0 to 1 percent slopes. Water stands in the small depressions after a rain.**

Most of the acreage is cultivated; the rest is used for pasture and hay. The main crops are cotton, corn, small grains, and grain sorghum. Crop growth is moderately good.

Representative profile of a Hunt clay at the center of a microdepression that has been partly obliterated by cultivation (in field 1,000 feet north of county road, from a point 3.7 miles south of intersection of Farm Road 547 and Texas Highway 24; about 2.7 miles east of the intersection of Texas Highway 24 and Texas Highway 78 in Farmersville):

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak subangular blocky and weak granular structure; hard when dry, firm when moist, very sticky and plastic when wet; neutral; noncalcareous; abrupt, smooth boundary.

A11—6 to 20 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, fine, angular blocky structure; aggregates have shiny pressure faces; extremely hard when dry, very firm when moist, very sticky and plastic when wet; mildly alkaline; noncalcareous; gradual, wavy boundary.

A12—20 to 36 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; distinct parallelepipeds that have long axes tilted more than 10 degrees from the

horizontal; few, distinct, intersecting, grooved slickensides in the lower part; aggregates have shiny pressure faces; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; few, small, weakly and strongly cemented concretions of calcium carbonate; moderately alkaline; calcareous; gradual, wavy boundary.

AC—36 to 46 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; aggregates have shiny pressure faces; distinct, grooved slickensides that intersect; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; many weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C—46 to 52 inches +, mottled gray (10YR 5/1) and light-gray (10YR 7/1) clay, gray (10YR 5/1) and light gray (10YR 6/1) when moist; few, medium, distinct mottles of brownish yellow; weak angular blocky structure; extremely hard when dry, extremely firm when moist; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

Representative profile of a Hunt clay at the center of a microknoll, about 8 feet from the profile just described:

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak subangular blocky and weak granular structure; hard when dry, firm when moist, very sticky and plastic when wet; mildly alkaline; noncalcareous; abrupt, smooth boundary.

A1—6 to 20 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate, medium, angular blocky structure; aggregates have shiny pressure faces; extremely hard when dry, very firm when moist, very sticky and very plastic when wet; few, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; gradual, wavy boundary.

AC—20 to 46 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; distinct parallelepipeds that have long axes tilted more than 10 degrees from the horizontal; aggregates have shiny pressure faces; distinct, grooved slickensides that intersect; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C—46 to 52 inches +, mottled gray (10YR 5/1) and light-gray (10YR 7/1) clay, gray (10YR 5/1) and light gray (10YR 6/1) when moist; few, medium, distinct, brownish-yellow mottles; weak angular blocky structure; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

Within a linear distance of about 6 to 12 feet, the A horizon ranges from 12 to 22 inches in thickness in the center of the microknoll to about 30 to 60 inches in the center of the microdepression. In undisturbed areas, the microknolls are about 8 to 18 inches higher than the microdepressions. When dry, the A horizon ranges from dark gray to very dark gray in hue of 10YR and 2.5Y, value of 3 or 4, and chroma of less than 1.5. The content of clay in the A horizon ranges from 45 to 55 percent.

The AC horizon ranges from 8 to 40 inches in thickness. When the AC horizon is dry, it ranges from gray to dark grayish brown in hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Depth of calcareous material ranges from 6 to 30 inches.

The C horizon ranges from gray to pale olive in hue of 10YR, 2.5Y, or 5Y.

Hunt soils are closely associated with the Burleson, Houston Black, and Wilson soils. Hunt soils have more lime in the lower part of their solum than have the noncalcareous, crusty Burleson soils. Unlike the Houston Black soils, Hunt soils have a noncalcareous surface layer and only a little calcium carbonate in the solum. They have a more clayey A horizon than have the Wilson soils, though the Wilson soils have a dense clay B2t horizon.

Hunt clay, 0 to 1 percent slopes (HuA).—This soil occupies uplands throughout the county. The soil areas are oval and range from 5 to 90 acres in size. Gilgai microrelief is common in undisturbed areas.

In the center of a microdepression, the surface layer is very dark gray clay about 50 inches thick. The upper 25 inches of this layer is noncalcareous. Below the surface layer is gray, calcareous clay that is extremely firm when moist. Mottled gray clay is at a depth of about 70 inches.

Included with this soil in mapping were areas of Burleson clay, Houston Black clay, and Wilson clay loam. These areas are 2 to 3 acres in size and make up less than 5 percent of any area mapped.

Surface runoff is slow, and the hazard of erosion is slight. Available water capacity is moderate. Cultivated crops grow moderately well.

Nearly all of this soil is cultivated, and the rest is used for pasture and hay. Cotton, corn, small grains, and grain sorghum are the main crops. Grassed waterways help to reduce erosion caused by runoff from surrounding soils. (Capability unit IIs–6; pasture and hayland group C)

Hunt clay, 1 to 3 percent slopes (HuB).—This soil occupies uplands throughout the county. The soil areas range from 5 to 200 acres in size and are oval in shape. Slopes are slightly convex and average about 2 percent. Gilgai microrelief is common in undisturbed areas. A few rills and shallow gullies have formed in cultivated areas on slopes of about 3 percent. The profile of this soil is the one described as typical for the series.

Included with this soil in mapping were areas of Burleson clay, Houston Black clay, and Wilson clay loam. Also included were a few areas that have a subsoil of reddish-brown, noncalcareous clay. The included areas make up less than 8 percent of any area mapped.

Surface runoff, available water capacity, and the hazard of erosion are moderate.

Crops grow moderately well on this soil. Most of the acreage is cultivated, and the rest is used for pasture and hay. Cotton, small grains, and grain sorghum are the main crops. Terraces and contour farming are needed to control water erosion in cultivated fields. In some fields grassed waterways and diversion terraces can be used to control water erosion and runoff. (Capability unit IIe–1; pasture and hayland group C)

Lamar Series

In the Lamar series are deep, well-drained, loamy soils that are severely eroded. These soils are moderately sloping to strongly sloping. They are on uplands, mainly in the eastern part of the county.

In a typical profile, the surface layer is grayish-brown, calcareous clay loam about 6 inches thick. The subsoil is friable, light olive-brown clay about 13 inches thick. The underlying layer, at depths between 19 and 46 inches, is light yellowish-brown clay loam.

Water erosion is moderately severe to severe. Available water capacity and permeability are moderate.

Most of the acreage is in fields that were once cultivated but are now used for pasture. Stands of native grasses are

thin. Small grains are grown in a few areas, but crops do not grow well.

Representative profile of a Lamar clay loam (in pasture, 500 feet south of county road, from a point 0.5 mile east and 1.5 miles north of the intersection of county road and Farm Road 2194, which is about 4.5 miles northeast of the intersection of Farm Road 2194 and Texas Highway 78 in Farmersville) :

A—0 to 6 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; few worm casts; calcareous; clear boundary.

B—6 to 19 inches, light olive-brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist; few worm casts; few soft masses and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—19 to 46 inches +, light yellowish-brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) when moist; weak subangular blocky structure; hard when dry, friable when moist; many, small, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from light clay loam to clay loam in texture and, when dry, it ranges from light brownish gray to olive brown in hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The thickness of the A horizon ranges from 5 to 10 inches. In a few areas the A horizon is noncalcareous. The B horizon ranges from 8 to 20 inches in thickness. When this horizon is dry, the color range is the same as that for the A horizon. The C horizon overlies weakly cemented, calcareous sandstone at a depth of 5 to 8 feet.

Lamar soils are near the Crockett, Ferris, and Houston soils. The Lamar soils are more loamy throughout than the Crockett soils. They have a clay loam subsoil, but that of the Crockett soils is dense clay. Lamar soils are less clayey than the Houston soils and Ferris soils.

Lamar clay loam, 3 to 5 percent slopes, eroded (LaC2).—This moderately sloping soil occurs mainly in the eastern part of the county. It is in upland areas that slope to the natural drains. The soil areas are irregular in shape and have an average size of about 40 acres. A few areas have broad, shallow gullies, but they are easily crossed by farm machines. In a few places, erosion has exposed the subsoil.

This soil has a slightly thicker surface layer than that in the profile described as typical for the Lamar series. The surface layer is grayish-brown, calcareous clay loam about 8 inches thick. The subsoil is light olive-brown, calcareous clay loam that is friable when moist. Light yellowish-brown clay loam is at a depth of about 24 inches.

Included with this soil in mapping were areas of eroded Crockett soils, severely eroded Ferris clay, and eroded Houston clay. They are 1 to 4 acres in size and make up less than 6 percent of any area mapped.

Surface runoff is moderately rapid; permeability and the available water capacity are moderate. The hazard of water erosion is moderately severe.

Only a few areas of this soil are cultivated. Small grains are better suited than other crops, but cultivated crops do not grow well. Most of the areas that were once cultivated are now used for improved pasture consisting mainly of johnsongrass and common and Coastal bermudagrasses. Terraces and contour farming are needed for controlling water erosion in cultivated areas. Grassed waterways and diversion terraces help to control runoff from surrounding areas. (Capability unit IIIe–5; pasture and hayland group E)

Lamar clay loam, 5 to 8 percent slopes, eroded (LaD2).—This soil occurs mainly in the eastern part of the county in areas that slope to natural drains. These areas are irregular in shape and have an average size of about 25 acres. Rills and gullies are numerous, but most of them can be crossed by farm machines. In a few places erosion has exposed the subsoil. The profile of this soil is the one described as typical for the Lamar series.

Included with this soil in mapping were areas of eroded Crockett soils, severely eroded Ferris clay, and eroded Houston clay. These areas are 2 to 4 acres in size, and they make up less than 8 percent of any areas mapped.

Permeability and available water capacity are moderate. Surface runoff is rapid, and the hazard of erosion is severe.

Most of this soil is used for pasture. Almost all of the areas that were cultivated now support weedy, poor to fair stands of native grasses. A few areas are used for small grains, but crops do not grow well. In cultivated fields terraces and contour farming are needed to help control water erosion. Grassed waterways and diversions help to reduce runoff from other areas. (Capability unit IVe–3; pasture and hayland group E)

Lamar clay loam, 5 to 12 percent slopes, severely eroded (LaE3).—This soil occupies upland areas that slope to the natural drains. Most areas are in the eastern part of the county. The soil areas are irregular in shape and average about 25 acres in size. Many areas are cut with deep gullies that cannot be crossed by farm machines. In many areas erosion has removed all the surface layer and has exposed the subsoil. Marine fossils are scattered over the surface in many places.

This soil has a slightly thinner solum than the one in the profile described as typical for the Lamar series. The surface layer is grayish-brown, calcareous clay loam about 5 inches thick. The subsoil is light olive-brown, calcareous clay loam that is friable when moist. Light yellowish-brown clay loam is at a depth of about 15 inches.

Included with this soil in mapping were areas of severely eroded Ferris-Houston clays, 5 to 12 percent slopes. They are 2 to 4 acres in size and make up less than 10 percent of any area mapped.

Cultivated crops are not suited, for surface runoff is rapid, and the hazard of water erosion is severe. Permeability and available water capacity are moderate.

Most fields that were once cultivated are now used for pasture of native grasses. Stands of grasses are thin and weedy, though pasture is a better use than cultivated crops. Little bluestem, sideoats grama, and buffalograss are the main native grasses. (Capability unit VIe–2; pasture and hayland group I)

Lewisville Series

The Lewisville series consists of deep, calcareous, clayey soils that are gently sloping to moderately sloping. These soils formed in alluvium deposited by streams that drain soils underlain by chalky limestone. They are on stream terraces and uplands in the eastern part of the county.

In cultivated areas, the surface layer (A horizon) of a typical profile is dark grayish-brown light silty clay about 16 inches thick. This layer grades gradually to the subsoil of grayish-brown, calcareous silty clay that contains free

lime and extends to a depth of 34 inches. The next layer consists of pale-brown silty clay and accumulated lime (fig. 14).

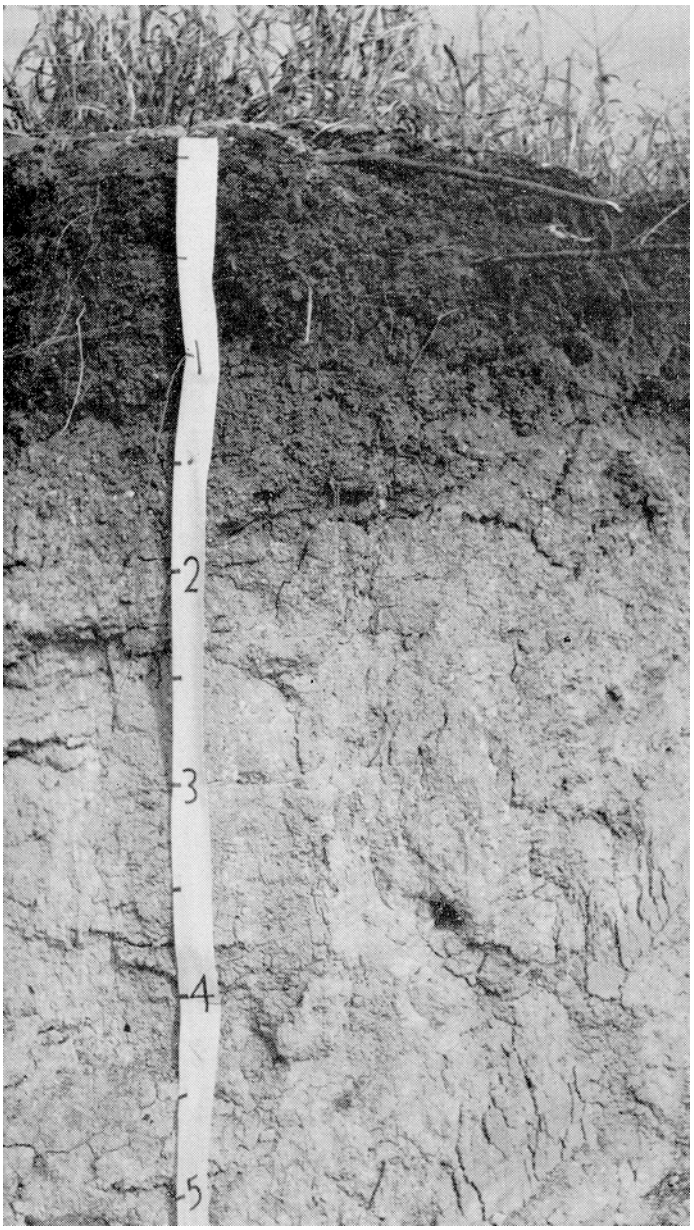

Figure 14.—**Profile of Lewisville silty clay, showing a zone of lime accumulation at a depth of about 2 feet.**

Lewisville soils have moderately slow permeability. Available water capacity is moderate. The hazard of erosion is moderate to moderately severe.

Most of the acreage is cultivated, and the rest is used for pasture and hay. Small grains and grain sorghum are the chief crops. Crops grow moderately well.

Representative profile of a Lewisville silty clay (in pasture, 60 feet east of county road, from a point 1.2 miles south of the intersection of county road and Farm Road 546, which is about 5 miles southeast of the intersection of Farm Road 546 and U.S. Highway 75 in McKinney):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) light silty clay, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky and weak granular structure; hard when dry, friable when moist; few strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 16 inches, dark grayish-brown (10YR 4/2) light silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; few root channels; many strongly cemented concretions of calcium carbonate about 2 to 5 millimeters in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

B—16 to 34 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; very hard when dry, firm when moist; many strongly cemented concretions of calcium carbonate 2 to 5 millimeters in diameter and a few threads of soft calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

Cca—34 to 64 inches +, pale-brown (10YR 6/3) silty clay, brown (10YR 5/3) when moist; weak subangular blocky structure; hard when dry, firm when moist; numerous soft masses of segregated calcium carbonate and a few, small, strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

All horizons range from silty clay to heavy clay loam; content of clay ranges from 35 to 50 percent. The A horizon ranges from 7 to 20 inches in thickness and, when dry, ranges from grayish brown to dark yellowish brown in hue of 7.5YR or 10YR, value of 4 or 5, chroma of 2 to 4. When the A horizon is moist, value ranges from 2 to less than 3.5. The B horizon is at least 1 unit higher in color value than the A horizon. The B horizon ranges from 13 to 25 inches in thickness. Depth to the Cca horizon ranges from 20 to 45 inches, but average depth is about 34 inches. The Cca horizon grades into clay loam, loam, or sandy loam alluvium, or it overlies beds of gravel at a depth of 3 to 15 feet. In a few places the Cca horizon rests on chalky limestone.

Lewisville soils occur closely with Altoga, Austin, and Houston Black soils. The surface layer of these soils is thicker than that of the Altoga soils. Lewisville soils formed over alluvial material, whereas Austin soils formed over clayey marl or chalky limestone. Lewisville soils are browner than the clayey Houston Black soils.

Lewisville silty clay, 1 to 3 percent slopes (LeB).—This soil occurs on stream terraces in the eastern part of the county. The soil areas are oblong and range from 5 to 40 acres in size. Slopes are slightly convex and average about 2 percent. The profile of this soil is the one described as typical for the Lewisville series.

Small areas of Houston Black clay were included with this soil in mapping. They are less than 4 acres in size and make up less than 5 percent of any mapped area.

Surface runoff, available water capacity, and the hazard of erosion are moderate. Permeability is moderately slow.

About 70 percent of this soil is cultivated; the rest is used for pasture and hay. Small grains and grain sorghum are the main cultivated crops. Cultivated crops grow moderately well.

In cultivated fields terraces and contour farming help to control water erosion. Grassed waterways and diversion terraces help to control runoff from surrounding areas. (Capability unit IIe-3; pasture and hayland group D)

Lewisville silty clay, 3 to 5 percent slopes, eroded (LeC2).—This eroded soil occupies stream terraces and areas that slope to streams. It occurs in the eastern part of the county. The areas are oblong and have an average size of about 35 acres. A few shallow gullies occur, but they can be easily crossed by farm machines. Erosion has exposed the subsoil material in a few places.

The solum of this soil is thinner than the one in the profile described as typical for the Lewisville series. The surface layer is dark grayish-brown, calcareous light silty clay about 11 inches thick. Below this layer is grayish-brown, calcareous, firm silty clay.

Included with this soil in mapping were areas of Houston Black clay. These areas are 1 to 4 acres in size and make up less than 8 percent of any area mapped.

Permeability is moderately slow, and available water capacity is moderate. Surface runoff is moderately rapid, and the hazard of erosion is moderately severe.

About 45 percent of the acreage of this soil is cultivated, and the rest is pasture. Cultivated crops are moderately well suited, and small grains and grain sorghum are grown in most cultivated areas. Common and Coastal bermudagrasses and johnsongrass are the main pasture grasses.

In cultivated fields contour farming and terraces are needed to control water erosion. Grassed waterways and diversion terraces help to control erosion caused by runoff from surrounding soils. (Capability unit IIIe–5; pasture and hayland group E)

Stephen Series

The Stephen series consists of shallow, calcareous, clayey soils that are underlain by chalky limestone. These soils are gently sloping to moderately sloping. They occur on uplands throughout the county.

In a typical profile, the surface layer (A horizon) is 14 inches thick. It is dark grayish-brown material that is light silty clay in the upper part and silty clay in the lower part. Fragments of limestone make up most of the next layer, which is six to eight parts fragments and one part silty clay in crevices between the fragments. Bedrock of chalky limestone is at a depth of about 20 inches (fig. 15).

Drainage is good, but permeability is moderately slow. The hazard of erosion is moderate to moderately severe.

Most of the acreage of Stephen soils is used for pasture and hay. Small grains are the main crops in cultivated areas.

Representative profile of a Stephen silty clay (in cultivated field, 120 feet east of gravel road, from a point 1.6 miles south of the intersection of the gravel road and Farm Road 720 in Frisco):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) light silty clay, very dark grayish brown (10YR 3/2) when moist; weak granular structure; hard when dry, firm when moist, sticky when wet; few small chalk fragments scattered over the surface and throughout the horizon; calcareous; moderately alkaline; abrupt boundary.

A1—5 to 14 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; few small chalk fragments; calcareous; moderately alkaline; abrupt, wavy boundary.

R&A1—14 to 20 inches, very stony silty clay consisting of material that is six to eight parts of chalky limestone fragments and one part of brown (10YR 4/3) silty clay in the crevices between the fragments; calcareous; moderately alkaline; abrupt boundary.

R—20 to 28 inches +, alternating beds of weakly and strongly cemented, white (10YR 8/2), chalky limestone; calcareous; moderately alkaline.

The A horizon ranges from 8 to 16 inches in thickness. When dry, it ranges from grayish brown to dark brown in hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1.5 to 3. When the A horizon is moist, value ranges from 2 to less than 3.5. The R&A1 layer is as much as 8 inches thick, but in places it is missing. When dry, it ranges from pale brown to dark brown; value is 1 unit higher than in the A horizon, and chroma is 1 unit weaker. Depth to the R layer of chalky limestone ranges from 8 to 20 inches.

Stephen soils occur closely with the Eddy and Austin soils, which are also underlain by limestone. The Stephen soils, however, are shallower to limestone than the Austin soils but are deeper to limestone than the Eddy soils.

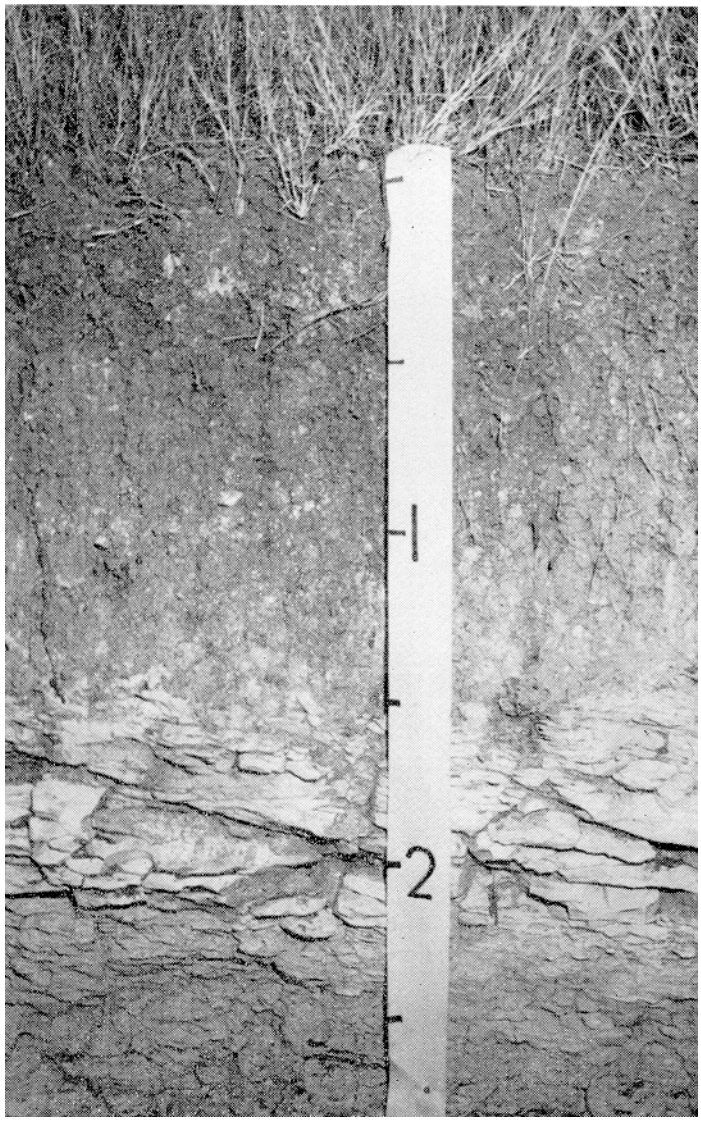

Figure 15.—**Profile of a Stephen silty clay. A distinct layer of chalky limestone is at a depth of about 20 inches.**

Stephen silty clay, 1 to 3 percent slopes (ScB).—This soil occurs throughout the county in areas that slope to natural drains. These areas are irregular in shape and range from 4 to 20 acres in size. Slopes average about 2 percent. The profile of this soil is the one described as typical for the Stephen series.

Included with this soil in mapping were areas of very shallow Eddy gravelly clay loam and deep Austin silty clay. These inclusions make up less than 8 percent of any area mapped.

This Stephen silty clay is well drained. Available water capacity and the hazard of erosion are moderate. Permeability is moderately slow.

About 60 percent of this soil is cultivated, and the rest is used for pasture and hay. Small grains are the chief crops, but in most years they do not grow well. In cultivated areas, terraces and contour farming help to control water erosion. In some areas grassed waterways are needed to reduce erosion caused by runoff from surrounding soils. Cultivated crops benefit if fertilizer is added. (Capability unit IIIe–6; pasture and hayland group H)

Stephen-Eddy complex, 3 to 5 percent slopes, eroded (SeC2).—These eroded soils are on ridgetops and in areas that slope to the natural drains, mainly in the western part of the county. Soil areas are irregular in shape and have an average size of about 75 acres. Many gullies occur.

In this complex Stephen silty clay makes up about 70 percent of the acreage; Eddy gravelly clay loam, 25 percent; and other soils, mostly Austin, the remaining 5 percent.

The Stephen soil is well drained and has moderately slow permeability and moderate available water capacity. The Eddy soil is well drained, but it is low in available water capacity. The hazard of erosion is moderately severe to severe.

The Stephen soil in this complex has a thinner solum than the one in the profile described as typical for the series. The surface layer is about 12 inches thick and consists of grayish-brown silty clay and free lime. Underlying this layer is about 4 inches of material that is eight parts of chalky limestone and one part brown silty clay. It is underlain by chalky limestone.

The Eddy soil also has a thinner solum than the one in the profile described as typical for its series. The surface layer is about 4 inches of grayish-brown gravelly clay loam and free lime. It is underlain by about 4 inches of whitish chalk with grayish-brown clay loam between the plates of chalk. Chalky limestone is at a depth of about 8 inches.

A few small areas in this complex are cultivated, and the rest is used for pasture. Small grains are the chief crops, though they do not grow well. Although crops are not suited to the thin Eddy soil, it is cultivated along with areas of the more arable Stephen soil (fig. 16). Pasture grasses are better suited than cultivated crops. The main pasture grasses are little bluestem and sideoats grama. Contour farming, terraces, and grassed waterways are needed for controlling water erosion in cultivated areas. Because the Eddy soil is so shallow, terraces are not suitable for controlling water erosion in parts of this complex that are mostly of Eddy soil. (Stephen soil is in capability unit IVe–4 and pasture and hayland group H; Eddy soil is in capability unit VIe–2, pasture and hayland group H)

Trinity Series

The Trinity series consists of deep, calcareous, clayey soils. These soils are on flood plains along the major streams and their tributaries, mainly in the eastern part of the county. Slopes are less than 1 percent.

In cultivated areas, the plow layer of a typical profile is very dark gray, calcareous clay about 5 inches thick. It is underlain by dark-gray, very firm clay that contains free lime and extends to a depth of about 14 inches. The next layer is dark-gray, very firm clay.

Figure 16.—**Grain sorghum on an area of Stephen-Eddy complex, 3 to 5 percent slopes, eroded. Crops do not grow well on the whitish spots of Eddy soil.**

When these soils are dry, they crack to a depth of at least 20 inches. These cracks are open for less than 90 days in a year. During each rain, water enters the cracks rapidly. The cracks close after a rain, and water moves into the soil very slowly.

Cotton, corn, small grains, and grain sorghum are grown in areas of Trinity soils that are flooded only occasionally. In these areas, crops generally grow well. The more frequently flooded areas are used for pasture and hay.

Representative profile of a Trinity clay (in cultivated field, 200 feet south of levee south of gravel road, from a point 1.6 miles west of the intersection of the gravel road with Texas Highway 78, which is about 3.4 miles south of the intersection of Texas Highway 78 and Farm Road 545 in Blue Ridge):

Ap—0 to 5 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; weak granular structure; very hard when dry, very firm when moist, very sticky when wet; calcareous; moderately alkaline; abrupt boundary.

A1—5 to 14 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, fine, angular blocky structure; aggregates have shiny pressure faces; very hard when dry, very firm when moist, very sticky when wet; calcareous; moderately alkaline; gradual boundary.

C—14 to 56 inches +, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak angular blocky structure in the upper part; below a depth of 24 inches, few parallelepipeds are distinct and have axes that tilted more than 10 degrees from the horizontal; very hard when dry, very firm when moist, very sticky when wet; calcareous; moderately alkaline.

The A horizon ranges from 12 to 20 inches in thickness. When dry, it ranges from gray to very dark gray in value of 3 to 5, chroma of 1 to 1.5, and hue of 10YR or 2.5Y. When the A horizon is moist, value ranges from 2 to less than 3.5. Faint, dark yellowish-brown to olive mottles occur in some places below a depth of 15 inches. In places the C horizon is stratified with thin layers and lenses of clay loam or silt loam. Beds of gravel underlie the C horizon at a depth of 6 to 10 feet in some areas.

Trinity soils occur with the Frio soils, but they are darker colored and more clayey.

Trinity clay, frequently flooded (0 to 1 percent slopes) (Tf).—This soil is on flood plains along the major streams and their tributaries, mainly in the eastern part of the county. Frequent flooding is likely. After some periods of flooding, thin deposits of silty material and litter are scattered over the surface. The surface is irregular and, in a few places, is marked by channel scars or partly filled old stream channels. The soil areas are oblong in shape, have smooth boundaries, and average about 100 acres in size. Surface runoff is very slow.

The surface layer of this soil is thicker than the one in the profile described as typical for the Trinity series. The surface layer is very dark gray clay about 20 inches thick. It contains free lime. This layer is underlain by a dark-gray substratum of very firm clay.

Included with this soil in mapping were small areas of loamy Frio soils. They make up less than 5 percent of any one soil area.

Flooding is so frequent that cultivated crops are not suited. Most areas are subject to washing, and they continually receive deposits of new material (fig. 17).

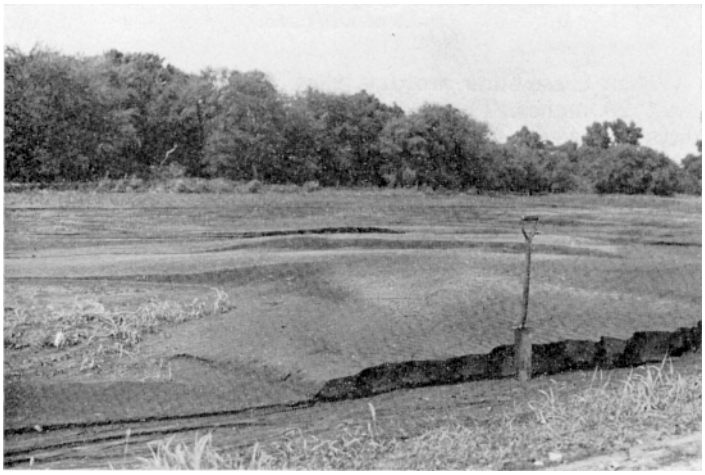

Figure 17.—**Soil material deposited by the flooding of an area of Trinity clay, frequently flooded.**

This soil is used mainly for pasture and hay. Johnsongrass, dallisgrass, common bermudagrass, and Coastal bermudagrass are well suited. The wooded areas along streams make good wildlife habitat. (Capability unit Vw–1; pasture and hayland group F)

Trinity clay, occasionally flooded (0 to 1 percent slopes) (To)—This soil occupies flood plains along the major streams and their tributaries, mainly in the eastern part of the county. In places the surface is slightly undulating, and the average slope is about 0.5 percent. The soil areas are oblong, have irregular boundaries, and have an average size of about 80 acres. Surface runoff is slow. The profile of this soil is the one described as typical for the Trinity series.

Included with this soil in mapping were areas of loamy Frio soils. They make up less than 10 percent of any area mapped.

Cultivated fields are along streams where occasional flooding is likely, but not during the growing season. Damage to crops seldom occurs, and when it does, it is slight. Cultivated crops usually grow well, and most of this soil is cultivated. Cotton, corn, grain sorghum, and small grains are the main crops. In most areas pasture and hay are suitable. Grassed waterways are needed in places to receive runoff water from higher areas. Diversion terraces are also helpful. Most cultivated crops benefit from applications of fertilizer. (Capability unit IIs–1; pasture and hayland group J)

Wilson Series

The Wilson series consists of deep, noncalcareous, loamy soils that have a subsoil of dense clay. These soils are nearly level to gently sloping. They are on uplands in the extreme northwestern corner and along the eastern boundary of the county.

In a typical profile, the surface layer is dark-gray, noncalcareous clay loam about 7 inches thick. The subsoil extends to a depth of about 36 inches. It is gray clay distinctly mottled with yellowish brown in the lower part. The substratum is light-gray clay.

Wilson soils crust readily after rains. When these soils dry, they crack to a depth of 20 inches. Water enters these cracks readily until these soils are again wetted. Then the cracks close, and movement of water into the soil is very slow. These soils have moderate available water capacity.

Most of the acreage is cultivated; the rest is pasture or hay. Cotton, small grains, and grain sorghum are the main crops. Crops grow moderately well in most years.

Representative profile of a Wilson clay loam (in a cultivated field, 80 feet south of county road, from a point 0.7 mile east of the intersection of the road and Farm Road 1777, which is 1.1 miles northwest of the intersection of Farm Road 1777 and U.S. Highway 67 in Royse City):

Ap—0 to 7 inches, dark-gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) when moist; gray (10YR 5/1) surface crust one-half inch thick; weak subangular blocky and weak granular structure; hard when dry, friable when moist; noncalcareous; abrupt, smooth boundary.

B21t—7 to 28 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; moderate, coarse, blocky structure; extremely hard when dry, extremely firm when moist; noncalcareous; gradual, smooth boundary.

B22t—28 to 36 inches, light-gray (10YR 6/1) clay, gray (10YR 5/1) when moist; few, medium, distinct mottles of yellowish brown; moderate, coarse, blocky structure; extremely hard when dry, extremely firm when moist; noncalcareous; gradual, smooth boundary.

C—36 to 60 inches +, light-gray (10YR 6/1) clay, gray (10YR 5/1) when moist; few, medium, distinct mottles of yellowish brown; massive; extremely hard when dry, extremely firm when moist; calcareous.

The A horizon ranges from 5 to 10 inches in thickness. The texture is generally clay loam, but in a few places it is fine sandy loam. When dry, the A horizon ranges from gray to dark grayish brown in hue of 10YR, value of 4 or 5, and chroma of 1 to 1.5. When the A horizon is moist, value ranges from 2 to less than 3.5.

The B2t horizon ranges from 20 to 40 inches in thickness. When dry, it ranges from light gray to grayish brown in hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. In some places the lower part of the B2t horizon is mottled with yellowish brown. These mottles cover as much as 10 percent of the material. In places the C horizon contains weakly to strongly cemented concretions of calcium carbonate.

Wilson soils occur with Burleson, Crockett, and Hunt soils. The surface layer of the Wilson soils is less clayey than that in the Burleson or Hunt soils. Wilson soils do not contain the yellowish-red mottles that characterize the Crockett soils.

Wilson clay loam, 0 to 1 percent slopes (WcA).—This soil occupies upland areas in the extreme northwestern

corner and along the eastern boundary of the county. The soil areas are oval in shape, have smooth boundaries, and range from 5 to 50 acres in size. Slopes average about 0.5 percent. Crusts form easily on the surface after a rain.

The solum of this soil is slightly thicker than that of the one described as typical for the Wilson series. The surface layer consists of about 10 inches of dark-gray, noncalcareous clay loam. The next layer is calcareous, dense, gray clay. Calcareous, light-gray clay is at a depth of about 40 inches.

Included with this soil in mapping were areas of Burleson clay and Hunt clay. The included areas are 2 to 3 acres in size and make up less than 6 percent of any area mapped.

More than half of this soil is cultivated; the rest is used for pasture or hay. Cotton, small grains, and grain sorghum are the main crops. In most years crops grow moderately well, partly because available moisture capacity is moderate. Diversion terraces and grassed waterways help to reduce erosion caused by runoff from other areas. (Capability unit IIs–5; pasture and hayland group A)

Wilson clay loam, 1 to 3 percent slopes (WcB).—This soil occupies upland areas in the extreme northwestern corner and along the eastern boundary of the county. The soil areas are oval and range from 5 to 150 acres in size. Slopes average about 2 percent. After a rain, crusts form on the surface. The profile of this soil is the one described as typical for the Wilson series.

Included with this soil in mapping were areas of Burleson clay, Hunt clay, and Crockett soils, 1 to 4 acres in size. Also included were areas of a Wilson soil that has a sandy loam surface layer. These inclusions make up less than 10 percent of any area mapped.

Available water capacity and the hazard of erosion are moderate. About half the acreage is cultivated, and the rest is used for pasture. Cultivated crops are moderately well suited. Cotton, small grains, and grain sorghum are the main crops. In cultivated fields, terraces and contour farming can be used to control water erosion. Grassed waterways help to control runoff from other areas. (Capability unit IIIe–1; pasture and hayland group A)

Use and Management of the Soils

The soils in Collin County are used mainly for pasture and hay and for dryfarmed crops. This section tells how the soils are used for these purposes. It also tells how the soils are used in building roads, farm ponds, and other engineering structure, and for community development and recreational facilities.

In describing management of soils for pasture and hay and for dryfarmed crops, the procedure is to group similar soils and to discuss management of each group. For dryfarmed crops, soils are grouped according to the nationwide system of capability classification, which is described in this section. Also given are predicted yields of the main crops.

Managing Soils Used for Crops

In Collin County management is needed mainly for (1) controlling erosion, (2) maintaining soil tilth, and (3) maintaining fertility. In the following paragraphs the main practices used to accomplish these purposes are discussed.

Use of crop residue.—By leaving a sufficient amount of residue on the more clayey soils, such as the Hunt, Houston Black, and Burleson, water erosion is controlled and moisture is conserved. If this residue is plowed under, it improves soil tilth.

Terraces farmed on the contour.—If terraces are farmed on the contour (fig. 18), they help to control water erosion. This practice is most beneficial on soils that have slopes of more than 1 percent, such as Houston Black clay, 1 to 3 percent slopes.

Use of cover crops.—Cover crops are used to furnish protective cover during the interval between the time of harvest and the time of planting the next cultivated crop. Examples of cover crops suitable for most soils in the county are small grains, sweetclover, and mixtures of annual grasses and legumes.

Maintaining soil fertility.—In Collin County crops respond to additions of fertilizers. If other good practices of soil management are used and proper amounts of fertilizer are applied, fertility can be maintained. Information on soil testing and application of fertilizer can be obtained from the Soil Conservation Service or the Agricultural Extension Service.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to most horticultural crops, or to rice and other crops that have their own special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. Classes are defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Figure 18.—**Terraces farmed on the contour on Houston Black clay, 1 to 3 percent slopes.**

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife. (None in the county.)

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None in the county.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Collin County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–3 or IIIe–1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass. The capability units are not numbered consecutively in Collin County, because not all of the capability units used in Texas are in this county.

Management by capability units

In this subsection each capability unit in Collin County is described, and use and management are briefly discussed. The mention of soil series in the description of a capability unit does not mean that all the soils in the series are in the unit. To find the name of the soils in any capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

Only Frio clay loam, occasionally flooded, is in this capability unit. This deep, nearly level soil occupies a small acreage on flood plains that occasionally are damaged by floodwater. Normally, this soil is not flooded during the growing season, and damage to crops is not significant.

This soil has a calcareous clay loam surface layer that is easy to work. The subsoil is also clay loam and is moderately permeable to air, roots, and water. In most places erosion is not a hazard.

Most of this soil is used for crops; the rest is used for pasture or hay. In cultivated areas the main crops are cotton, corn, small grains, and grain sorghum. Pecans, sweetclover, and alfalfa are also productive. Common and Coastal bermudagrasses are the main pasture grasses.

Management is needed for maintaining fertility. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. Crop residue increases the organic-matter content and helps to maintain good soil tilth. In some areas diversion terraces and grassed waterways are essential for protecting the soil from runoff from higher areas. Applications of fertilizer are needed on cultivated crops and forage crops.

CAPABILITY UNIT IIe-1

This unit consists of deep, gently sloping, clayey soils that are on uplands and terraces. These soils are in the Hunt and Houston Black series. They are the most extensive soils in the county and the most important for farming.

The soils in this unit have a clay surface layer that is difficult to work. When they are dry, these soils crack to a depth of more than 30 inches. Water enters the cracks rapidly. But the cracks seal when the soils are wet, and water enters very slowly. After the clayey subsoil is wet, it is slowly permeable to the movement of air, water, and roots. The hazard of erosion is moderate.

Most of the acreage is cultivated; the rest is used mainly for pasture and hay. Cotton, corn, small grains, and grain sorghum are the main cultivated crops, but cotton grown on areas of the Houston Black soil is considerably damaged by root rot. Sweetclover, alfalfa, vetch, and peas are grown in a few areas.

A suitable cropping system is one that includes small grains, grain sorghum, or other crops that leave a large amount of residue. Crop residue left on the surface protects these soils against erosion during heavy rains. In cultivated areas terraces and contour farming help to control water erosion. Diversion terraces and grassed waterways are needed for protection against runoff from other areas. Applications of fertilizer are needed for cultivated crops and forage.

CAPABILITY UNIT IIe-3

This unit consists of deep, gently sloping soils on uplands and terraces. These soils are in the Austin, Engle, and Lewisville series. They are moderately extensive in Collin County.

Their surface layer is calcareous silty clay or clay loam that is friable to firm and easy to work. The subsoil is silty clay or clay loam that has moderate to moderately slow permeability. Available water capacity is moderate. Erosion is moderate in the gently sloping areas.

These soils are used mainly for cultivated crops, pasture, and hay. Suitable crops are small grains, grain sorghum, corn, sweetclover, alfalfa, peas, and vetch. Johnsongrass, common bermudagrass, and Coastal bermudagrass are suitable pasture grasses, and vetch and buttonclover are suitable pasture legumes.

A suitable cropping system is one that provides a continuous cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Also needed are terraces and contour farming for the control of water erosion in cultivated areas. Grassed waterways and diversion terraces help to protect the soil against runoff from adjacent areas. Applications of fertilizer benefit both cultivated crops and forage crops.

CAPABILITY UNIT IIs-1

Trinity clay, occasionally flooded, is the only soil in this capability unit. This deep, nearly level soil is on flood plains that are occasionally flooded. The total acreage in this county is moderately extensive.

This soil has a calcareous clay surface layer that is difficult to work. When the soil is dry, it cracks to a depth of at least 20 inches. Water enters the cracks rapidly. When the soil is wet, the cracks close and movement of water into the soil is very slow.

Most of this soil is used for crops, and the rest is used for pasture and hay. The main cultivated crops are cotton, corn, small grains, and grain sorghum. Common and Coastal bermudagrasses are the main pasture grasses. Sweetclover and alfalfa grow well.

A suitable cropping system is one that provides grain sorghum or other crops that produce a large amount of crop residue. The residue adds to the organic matter in this soil and helps to maintain good tilth. In places diversion terraces and grassed waterways are needed to protect this soil against runoff from higher areas. Applications of fertilizer are needed on cultivated crops and forage crops.

CAPABILITY UNIT IIs-5

Wilson clay loam, 0 to 1 percent slopes, is the only soil in this capability unit. This deep, nearly level soil is in a small acreage on uplands of the county.

The surface layer is noncalcareous clay loam about 10 inches thick. It is underlain by a dense clay subsoil. The surface of this soil crusts after a rain, and when the soil dries, it cracks to a depth of 20 inches or more. The cracks seal when the soil is wet again, and water then moves into it very slowly. Movement of water, and of air and roots, is also impeded by the dense subsoil. During summer this soil is droughty.

Cropping systems are suitable if they provide grain sorghum or other crops that produce a large amount of crop residue. The residue helps to reduce surface crusting and, if mixed into the soil, improves tilth. Diversion terraces and grassed waterways are needed to help control

erosion caused by runoff from surrounding soils. Applications of fertilizer are needed for cultivated crops and forage crops.

CAPABILITY UNIT IIs–6

This capability unit consists of deep, nearly level, clayey soils. These soils are in the Burleson, Houston Black, and Hunt series. They occupy a moderately extensive acreage in the county and occur on uplands and stream terraces.

The soils in this unit have a clay surface layer that is difficult to work. After each rain, the surface of the Burleson soils crusts. When dry, all the soils in this unit have cracks that extend to a depth of more than 30 inches. Water enters these cracks rapidly, but the cracks close when the soils are wet, and water moves into them very slowly. When the clayey subsoil is wet, it impedes movement of water, air, and roots.

The soils of this unit are mostly cultivated. The main crops are cotton, corn, small grains, and grain sorghum, but sweetclover, alfalfa, vetch, peas, and onions are grown in some areas. Cotton root rot is the main concern on the Houston Black soils.

A cropping system is suitable if it provides small grains, grain sorghum, or other crops that produce a large amount of crop residue. The residue is effective in reducing surface crusting, and it also protects these soils during heavy rains. Grassed waterways are needed for protection against runoff from adjacent areas. Additions of fertilizer help increase growth of cultivated crops.

CAPABILITY UNIT IIIe–1

This unit consists of deep, gently sloping clays and clay loams on uplands. These soils are in the Burleson and Wilson series. They are moderately extensive in this county.

The surface layer of these soils is noncalcareous clay or clay loam, and the next layer is compact clay. Surface crusting is likely after a rain. When dry, these soils crack to a depth of 20 to more than 30 inches. The cracks seal when the soils are wet, and water enters them very slowly. The movement of water, and of air and roots, is also impeded by the dense subsoil.

The soils of this unit are used mostly for crops, but some areas are pastured. Cotton, small grains, and grain sorghum grow moderately well. Onions are well suited. Suitable legumes are peas and vetch.

A cropping system is suitable if it provides grain sorghum or other crops that produce a large amount of residue. The residue prevents crusting at the surface. Contour farming and terraces are helpful in controlling erosion in cultivated areas. Grassed waterways and diversions protect these soils against runoff from surrounding soils. Applications of fertilizer are needed for good growth of cultivated crops.

CAPABILITY UNIT IIIe–3

This unit consists of deep, gently sloping to moderately sloping, eroded, clayey soils. These soils are in the Houston and Houston Black series. They are on uplands and are extensive in the county.

The surface layer is calcareous clay that is difficult to work. When dry, these soils have cracks that extend to a depth of more than 30 inches. Water enters the cracks rapidly. When these soils are wet, the cracks seal and water enters the soil very slowly. When the dense subsoil is wet, it impedes the movement of water, and of air and roots as well.

The soils in this unit are used mainly for crops, though some areas are used for pasture. Small grains, grain sorghum, sweetclover, peas, and vetch are the main crops. Cotton and corn are grown in a few areas, but row crops normally are not well suited. Cotton root rot is troublesome in some areas. Johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses are the main pasture grasses.

Management is needed to protect the soils against water erosion. The residue from crops helps to protect these soils from damaging rains. A cropping system is suitable if it provides small grains, grain sorghum, or other crops that produce a large amount of residue. Terraces and contour farming are needed to control water erosion in cultivated fields. Diversion terraces and grassed waterways help to control erosion and runoff. Cultivated crops and forage crops grow best if fertilizer is added.

CAPABILITY UNIT IIIe–5

This unit consists of deep, moderately sloping, eroded soils on rolling uplands. These soils are in the Austin, Engle, Lamar, and Lewisville series. They are extensive in this county.

The surface layer is calcareous silty clay or clay loam that is friable and easy to work. The subsoil is silty clay or clay loam that has moderate to moderately slow permeability. Available water capacity is moderate. The hazard of erosion is moderately severe.

Cultivated crops, pasture, and hay are the main uses. Suitable crops are small grains, grain sorghum, sweetclover, peas, and vetch. Suitable pasture grasses are johnsongrass and common and Coastal bermudagrasses. Vetch and buttonclover are legumes suitable for pasture.

A cropping system is suitable if it provides continuous vegetation or crops that provide a large amount of residue. The residue helps to control erosion and to conserve moisture. In cultivated areas terraces and contour farming are essential for controlling water erosion. Grassed waterways and diversion terraces are needed for reducing erosion caused by runoff from adjacent areas. Applications of fertilizer are needed for cultivated crops and forage crops.

CAPABILITY UNIT IIIe–6

Only Stephen silty clay, 1 to 3 percent slopes, is in this capability unit. This moderately deep soil occurs on uplands and is inextensive in this county.

The surface layer of this soil is calcareous silty clay. The underlying layer is stony silty clay that has moderately slow permeability. A few fragments of chalky limestone are scattered on the surface. The hazard of erosion is moderate in the more sloping areas.

Because this soil is droughty during the summer, cool-season crops are well suited. Crops and pasture are the main uses. Small grains and sweetclover are well-suited feed crops, but row crops normally do not grow well. Well-suited grasses are common and Coastal bermudagrasses, King Ranch bluestem, sideoats grama, and johnsongrass. Suitable legumes are buttonclover, peas, and vetch.

A cropping system is suitable if it provides continuous vegetation or crops that produce a large amount of residue. The crop residue helps to conserve moisture and control erosion. Contour farming and terraces are needed to help control water erosion in cultivated areas. Diversion terraces and grassed waterways are needed for protection

against runoff from adjacent areas. Cultivated crops and forage crops need fertilizer.

CAPABILITY UNIT IVe-2

In this unit are deep, moderately sloping, eroded, clayey soils on rolling uplands. These soils are in the Ellis and Houston series. The Ellis soil is in a small acreage in the county, but the Houston soil is moderately extensive.

Both kinds of soil have a clay surface layer that is difficult to work. When they are dry, these soils crack to depths of 20 to 30 inches or more. The cracks seal when the soils are wet, and the subsoil becomes very slowly permeable to water, air, and roots. Erosion is the main risk. These soils have been considerably damaged by erosion and in places are gullied. A few of the gullies are deep and cannot be crossed by farm machinery.

Cultivated crops and pasture are grown in most areas. Row crops do not grow well, but pasture is a good use. Suitable crops are small grains, sweetclover, peas, and vetch. Little bluestem, King Ranch bluestem, sideoats grama, and common and Coastal bermudagrasses are suitable pasture grasses.

Cropping systems are suitable if they provide grain sorghum or other crops that produce a large amount of residue. Crop residue left on the surface protects these soils against erosion until the next crop can be seeded. In cultivated areas contour farming and terraces help to control water erosion. Grassed waterways and diversion terraces are needed for protection against runoff from surrounding areas. Applications of fertilizer are needed for cultivated crops and forage.

CAPABILITY UNIT IVe-3

This unit consists of deep, sloping, eroded soils. These soils are in the Altoga, Austin, and Lamar series. They are on rolling uplands and are moderately extensive in the county.

The surface layer of these soils is calcareous silty clay or clay loam that is easy to work. The subsoil of silty clay or clay loam has moderate to slow permeability. Available water capacity is moderate. Erosion is severe in cultivated areas.

Cultivated crops are grown in most areas, but pasture and hay are good uses. Suitable crops are small grains, grain sorghum, and sweetclover. King Ranch bluestem and common and Coastal bermudagrasses are suitable pasture grasses.

A suitable cropping system is one that provides a continuous cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Terraces and contour farming are needed to control water erosion in cultivated areas. Diversion terraces and grassed waterways give the best protection against runoff from adjacent areas. Additions of fertilizer are needed for cultivated and forage crops.

CAPABILITY UNIT IVe-4

Only a Stephen soil mapped in a complex with an Eddy soil is in this capability unit. This soil is eroded silty clay that is on rolling uplands. The total acreage is about 70 percent of the mapping unit and is in a small acreage in the county.

298-732—68——3

This soil has a calcareous surface layer of light silty clay in the upper part and silty clay in the lower part. The underlying layer is silty clay that has moderately slow permeability. Fragments of limestone are scattered over the surface. Because this soil is droughty in summer, cool-season crops are well suited.

Cultivated crops and pasture are the dominant uses. Small grains and sweetclover are the main crops, but row crops normally do not grow well. Johnsongrass, common and Coastal bermudagrasses, King Ranch bluestem, and sideoats grama are suitable pasture grasses. Suitable legumes are buttonclover, peas, and vetch.

A suitable cropping system is one that provides a continuous cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Also needed are terraces and contour farming for control of water erosion in cultivated areas. Diversion terraces and grassed waterways give protection against runoff from surrounding areas. Applications of fertilizer are needed for cultivated crops and forage.

CAPABILITY UNIT IVe-5

This unit consists of deep, gently sloping to moderately sloping, eroded soils. These soils are in the Burleson and Crockett series. They are in a small acreage on rolling uplands in the county.

The surface layer of these soils is noncalcareous clay or clay loam to fine sandy loam. The surface layer of the Burleson soil crusts readily after a rain. When they are dry, all of these soils crack to depths of 20 to 30 inches or more. The cracks seal when the soils are wet. When the dense, clayey subsoil is wet, it is very slowly permeable and impedes the movement of air, water, and roots.

Cultivated crops and pasture are the dominant uses. Small grains, grain sorghum, sweetclover, peas, and vetch are the main crops. Johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses are suitable grasses.

Cropping systems are suitable if they provide a continuous cover of vegetation or provide crops that produce a large amount of residue. Diversion terraces and grassed waterways are needed for protection against runoff from outside areas. In cultivated areas terraces and contour farming are needed for control of water erosion. Applications of fertilizer are needed for cultivated crops and forage.

CAPABILITY UNIT IVs-1

Eddy gravelly clay loam, 1 to 3 percent slopes, is the only soil in this capability unit. This very shallow, gently sloping soil is on uplands. The total acreage in the county is small.

The surface layer is calcareous gravelly clay loam that is mixed with many fragments of chalky limestone. This layer is underlain by soft, chalky limestone and clay loam that have low available water capacity.

This soil is used mainly for cultivated crops, pasture, and hay. Row crops are not well suited, for the soil is droughty, but cool-season crops are a good use. Suitable crops are pasture and hay, but small grains and sweetclover grow fairly well. Suitable pasture grasses are common and Coastal bermudagrasses, King Ranch bluestem, and johnsongrass.

A suitable cropping system is one that provides a permanent cover of vegetation or provides crops that produce a large amount of crop residue. Crop residue left on the surface helps to control erosion and to conserve moisture. Applications of fertilizer benefit both cultivated crops and forage crops.

CAPABILITY UNIT Vw-1

This unit consists of deep, nearly level clays and clay loams on flood plains. These soils are moderately extensive along the major streams and their tributaries. They are in the Frio and Trinity series.

Frequent flooding is likely, and these soils are subject to washing and deposition of new soil material. They also receive runoff from surrounding, higher areas. When the clayey Trinity soil is dry, it cracks to a depth of at least 20 inches. Water enters the cracks rapidly until the soil is again wet. Then the cracks close, and water movement is very slow.

These soils are used mainly for pasture, hay, or some form of permanent vegetation. Cultivated crops are not suited. Common and Coastal bermudagrasses, johnsongrass, and dallisgrass are suitable grasses. Suitable legumes are vetch, buttonclover, and sweetclover. Some of the wooded areas along streams are used mostly as wildlife habitat.

CAPABILITY UNIT VIe-1

Only Crockett soils, 5 to 8 percent slopes, eroded, is in this capability unit. These deep, sloping, eroded soils are on rolling uplands. They are the least important for farming in the county, and their total acreage is the smallest in the county.

The surface layer is noncalcareous and ranges from clay loam to fine sandy loam. When the soils dry, they crack to a depth of at least 20 inches. Water enters the cracks rapidly. The cracks close when the soils are wet. When the dense, clayey subsoil is wet, it is very slowly permeable and slows the movement of water, air, and roots. These soils are droughty in summer, and they are highly susceptible to erosion.

Cultivated crops are not suited, though pasture and hay are good uses. The native vegetation is chiefly little bluestem, sideoats grama, and buffalograss.

CAPABILITY UNIT VIe-2

This unit consists of very shallow to deep, moderately sloping to strongly sloping soils on eroded to severely eroded, rolling uplands. The total acreage in the county is extensive.

The soils in this unit are single soils mapped in the Altoga, Eddy, and Lamar series. Also in this unit are the Ferris and Houston soils mapped as a complex and an Eddy soil mapped in a complex with a Stephen soil. These soils have a surface layer that is calcareous clay, silty clay, clay loam, or gravelly clay loam. Some of the soils have fragments of chalky limestone on the surface; others are likely to crack on the surface when dry, but the cracks seal when the soils are wet. The subsoil of these soils ranges from chalky limestone to dense clay.

These soils are so erodible and droughty that they are not suitable for cultivated crops. They are used for pasture and hay. The native vegetation is mostly little bluestem, sideoats grama, and buffalograss.

Predicted Yields on Dryland Soils

Yields of crops depend chiefly on the tilth and fertility of the soils and on a sufficient supply of moisture at the time of planting and throughout the growing season. Lack of moisture commonly is the limiting factor in Collin County. Consistent high yields on any soil normally indicate that the soil has been well managed; that is, fertility has been kept at a high level; rainwater has been held in the soil; erosion has been controlled; and suitable cropping systems have been used. On the other hand, consistent low yields indicate the soil has not been well managed; that is, it has not been given protection against the loss of soil and water, and measures have not been taken to improve fertility and tilth.

Table 2 gives predicted yields of principal crops grown in the county on arable dryfarmed soils. Soils not generally used for these crops are not listed in table 2. The yields given cannot be expected every year; they are estimated averages for a 15- to 20-year period. In some years yields will be higher, and in other years they will be lower. The yields in table 2 are based on records of experiment stations and on information from farmers and others familiar with the soils of the county.

The yields in columns A are those expected under ordinary management, or the management followed by most of the farmers in the county. One or more of the practices listed for a high level of management are not followed.

The yields in columns B are those expected under a high level of management. Only a few farmers use this level of management, and they obtain high yields. All of the following practices are used:

1. Crop residues are kept on the surface or are plowed under to control erosion and maintain tilth.
2. Suitable cropping sequences are used to maintain an adequate supply of organic material.
3. Rainfall is effectively used and conserved.
4. Soil fertility is maintained by applying fertilizers at the proper time and by growing soil-improving crops.
5. Insects, diseases, and weeds are effectively controlled.
6. Tillage is minimum but timely.
7. Improved crop varieties and strains are used.
8. Tilling is done when the moisture content is such that soil compaction is lessened.
9. Mechanical practices are effectively used and maintained.
10. Pasture is used properly, and grazing is rotational.

Use of the Soils for Pasture and Hay

Pasture and hay are important in Collin County because raising livestock is the main enterprise. The most important grasses are Coastal and common bermudagrasses. These grasses are best suited to the Houston Black, Trinity, Austin (fig. 19), and other deep soils.

In Collin County the present trend is to convert cropland to improved pasture and hayland. An improved pasture or meadow is one in which introduced grasses are

TABLE 2.—*Predicted average acre yields of principal dryland soils under two levels of management*

[Yields in columns A are those obtained under ordinary management or the management used by most farmers in the county; yields in columns B are those to be expected under a high level of management]

Soil	Cotton (lint)		Wheat		Grain sorghum		Corn	
	A	B	A	B	A	B	A	B
	Lbs.	*Lbs.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*	*Bu.*	*Bu.*
Altoga silty clay, 5 to 8 percent slopes, eroded			10	20				
Austin silty clay, 1 to 3 percent slopes	190	400	22	32	3, 800	5, 500	27	50
Austin silty clay, 3 to 5 percent slopes, eroded	120	280	18	25	3, 000	3, 800	20	35
Austin silty clay, 5 to 8 percent slopes, eroded			12	20				
Burleson clay, 0 to 1 percent slopes	225	420	20	30	3, 800	5, 800	20	45
Burleson clay, 1 to 3 percent slopes	185	380	18	28	3, 200	5, 200	18	40
Burleson clay, 2 to 4 percent slopes, eroded	100	200	14	25	2, 200	4, 500	16	30
Crockett soils, 2 to 5 percent slopes, eroded	100	200	12	25	2, 000	4, 300	16	30
Eddy gravelly clay loam, 1 to 3 percent slopes			8	13				
Engle clay loam, 1 to 3 percent slopes	160	360	18	28	2, 600	5, 000	20	45
Engle clay loam, 3 to 5 percent slopes, eroded	90	180	16	24	2, 000	3, 800	15	30
Frio clay loam, occasionally flooded	250	470	25	38	4, 500	6, 600	33	65
Houston clay, 3 to 5 percent slopes, eroded	175	350	20	28	2, 000	4, 100	20	45
Houston clay, 5 to 8 percent slopes, eroded			10	20				
Houston Black clay, 0 to 1 percent slopes	235	475	25	35	3, 900	6, 600	30	58
Houston Black clay, 1 to 3 percent slopes	225	450	23	31	3, 800	6, 400	30	57
Houston Black clay, 2 to 4 percent slopes, eroded	200	390	22	30	3, 000	5, 500	27	52
Hunt clay, 0 to 1 percent slopes	235	440	25	35	3, 900	6, 600	30	58
Hunt clay, 1 to 3 percent slopes	225	425	23	30	3, 800	6, 400	27	56
Lamar clay loam, 3 to 5 percent slopes, eroded	120	320	15	22	2, 200	4, 500	15	40
Lamar clay loam, 5 to 8 percent slopes, eroded			10	20				
Lewisville silty clay, 1 to 3 percent slopes	190	390	22	28	3, 800	6, 500	30	58
Lewisville silty clay, 3 to 5 percent slopes, eroded	130	320	14	23	2, 000	4, 200	15	35
Stephen silty clay, 1 to 3 percent slopes	120	240	15	23	2, 500	3, 800	16	36
Stephen-Eddy complex, 3 to 5 percent slopes, eroded	80	150	10	16	2, 000	3, 200	10	25
Trinity clay, occasionally flooded	225	450	22	35	4, 200	6, 800	35	60
Wilson clay loam, 0 to 1 percent slopes	165	380	18	22	3, 000	5, 200	22	48
Wilson clay loam 1 to 3 percent slopes	156	360	13	18	2, 700	4, 500	20	40

***Figure 19.*—Quarter horses grazing in pasture of Coastal bermudagrass on an area of Austin silty clay, 1 to 3 percent slopes.**

used for obtaining high yields of forage. In one 5-year period, about 20,000 acres of cropland was sprigged to Coastal bermudagrass.

Coastal bermudagrass is a high-producing, high-quality grass that is established by sprigging. The grass requires a high level of soil management, including fertilization. If Coastal bermudagrass is used on Houston Black clay, Trinity clay, or similar soils, nitrogen and phosphate fertilizers are especially needed.

The Hoblitzelle Agricultural Laboratory at Renner harvested 6 tons of Coastal bermudagrass per acre on Houston Black clay. This trial planting was fertilized with 260 pounds of nitrogen per acre in three applications. The yield was 5 tons per acre more than was obtained in an adjacent trial planting where fertilizer was not added (*2*).

Common bermudagrass requires management similar to that used for Coastal bermudagrass. This grass can be either sprigged or sowed, but on the clayey soils, the sprigging is more successful than sowing.

King Ranch bluestem commonly is planted on very shallow or moderately deep soils, such as the Eddy and Stephen soils. It also grows well on the severely eroded Altoga, Ferris, and Lamar soils. Rolling areas of Austin and Lewisville soils are well suited to sideoats grama and all of the bluestem grasses.

More johnsongrass is grown in meadows than in pastures. Johnsongrass is well suited to deep soils, such as the Trinity, Frio, and Houston Black.

Some pastures and meadows in Collin County are not fertilized or mowed. The forage plants consist mainly of big bluestem, little bluestem, dropseed, sideoats grama, and other native grasses. Grazing management helps these grasses to increase.

A well-managed pasture requires rotational grazing, proper use, weed control, fertilization, and an adequate supply of water for the livestock. On well-managed soils in hay, fertilizer is applied and the forage is cut at proper intervals and when the grasses are at correct heights.

Pasture and hayland suitability groups

The soils in Collin County have been placed in pasture and hayland groups according to their suitability for the growth of forage. The soils in each group are enough alike to be suited to the same grasses, to require similar management, and to produce similar yields. Thus, these groups are convenient because management can be suggested that applies to all the soils in the group. The pasture and hayland groups in Collin County are identified by capital letters. Pasture and hayland group G was omitted because none of the soils in this group occur in Collin County. In the discussion of the nine groups in the county, the soils in the group are described, management briefly is discussed, and yields at two levels of management are given.

The mention of soil series in each pasture and hayland group does not mean that all the soils in the series are in the group. The names of the soils in any group can be found by referring to the "Guide to Mapping Units" at the back of this survey.

PASTURE AND HAYLAND GROUP A

This pasture and hayland group consists of deep, noncalcareous soils that have a loamy and clayey surface layer. These soils are in the Burleson and Wilson series. They are nearly level to gently sloping and occur mostly on uplands in the extreme northwestern corner of the county and along the east and west boundaries. Some areas are on old alluvial stream terraces, mainly in the eastern part of the county.

The soils in this group have a clay or clay loam surface layer that crusts easily after a rain. When these soils are dry, they have cracks that extend to a depth of 20 to 30 inches or more. Water enters the cracks rapidly. When the soils are wet, the cracks seal and water enters very slowly. Available water capacity is moderate. The growth of forage plants is moderate to moderately good.

These soils are used for pasture and hay consisting mainly of common and Coastal bermudagrasses. Under an average level of management, Coastal bermudagrass produces about 3.5 animal-unit-months of grazing per acre or about 2.1 tons of hay, and common bermudagrass produces about 3.0 animal-unit-months of grazing per acre or about 1.8 tons of hay. Under a high level of management, Coastal bermudagrass produces about 6.0 animal-unit-months per acre or about 3.6 tons of hay, and common bermudagrass produces about 4.8 animal-unit-months per acre or about 2.9 tons of hay.

PASTURE AND HAYLAND GROUP B

This group consists of deep, noncalcareous soils that have a loamy and clayey surface layer. These soils are in the Burleson and Crockett series. They are gently sloping to sloping and occur on old alluvial stream terraces, mainly in the eastern part of the county. They are also on uplands through the county.

Erosion has removed the original surface layer in many places, and the subsoil is exposed. Broad shallow gullies and many rills have been cut. When these soils are dry, they have cracks that extend to a depth of 20 to 30 inches or more. Water enters these soils rapidly until they are wet. Then the cracks close, and water enters the soils very slowly.

These soils are used mainly for pasture. A few of the less sloping areas are used for hay. Coastal and common bermudagrasses, King Ranch bluestem, and johnsongrass are the main grasses.

Under an average level of management, Coastal bermudagrass produces about 2.0 animal-unit-months of grazing per acre or about 1.2 tons of hay, and common bermudagrass produces about 2.6 animal-unit-months per acre or about 1.5 tons of hay. If a high level of management is used, Coastal bermudagrass yields about 4.5 animal-unit-months per acre or about 2.7 tons of hay, and common bermudagrass yields about 3.6 animal-unit-months per acre or about 2.2 tons of hay.

PASTURE AND HAYLAND GROUP C

This pasture and hayland group consists of deep, clayey soils that are nearly level to sloping. These soils are in the Hunt, Houston, and Houston Black series. They occur on uplands throughout the county.

The soils in this group have a surface layer and subsoil that are calcareous or noncalcareous clay. In some areas the surface layer is eroded and many gullies and rills have been cut. When they are dry, these soils have cracks that extend to a depth of more than 30 inches. Water enters the cracks rapidly. When the soils are wet, the cracks seal and water enters the soils very slowly.

The soils in this group are used for pasture and hay consisting mainly of common and Coastal bermudagrasses and johnsongrass. Under an average level of management, Coastal bermudagrass yields about 4.2 animal-unit-months of grazing per acre or about 2.5 tons of hay, and common bermudagrass yields about 3.5 animal-unit-months per acre or about 2.1 tons of hay. Under a high level of management, Coastal bermudagrass produces about 8.3 animal-unit-months per acre or about 5.0 tons of hay, and common bermudagrass produces about 6.0 animal-unit-months per acre or about 3.6 tons of hay.

PASTURE AND HAYLAND GROUP D

This pasture and hayland group consists of deep, calcareous soils that have a loamy and clayey surface layer. These soils are in the Austin, Engle, and Lewisville series. They are gently sloping and occur mostly on uplands throughout the county.

The soils in this group have a friable silty clay or clay loam surface layer. The subsoil is silty clay or clay loam that is moderately to moderately slowly permeable. Available water capacity is moderate.

These soils are used for both pasture and hay. Well-suited grasses are johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses. In most years forage plants grow in moderate stands.

Under an average level of management, Coastal bermudagrass yields about 3.5 animal-unit-months per acre or about 2.1 tons of hay, and common bermudagrass yields about 2.6 animal-unit-months per acre or about 1.6 tons of hay. Under a high level of management, Coastal bermudagrass yields about 7.0 animal-unit-months per acre or about 4.2 tons of hay, and common bermudagrass yields about 5.2 animal-unit-months per acre or about 3.1 tons of hay.

PASTURE AND HAYLAND GROUP E

This pasture and hayland group consists of deep, eroded, calcareous soils that are in the Altoga, Austin, Engle, Lamar, and Lewisville series. These soils are moderately sloping to sloping and are on alluvial terraces and uplands throughout the county.

The subsoil of the soils is exposed in places. In some fields shallow gullies have been cut. The surface layer is friable silty clay or clay loam. The subsoil is silty clay or clay loam that is moderately to moderately slowly permeable. Available water capacity is moderate.

Because these soils are sloping and eroded, they are better suited to pasture than to hay. Only a few areas are used for hay. Suitable pasture grasses are johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses.

If an average level of management is used, Coastal bermudagrass yields about 3.0 animal-unit-months of grazing per acre, or about 1.8 tons of hay, and common bermudagrass produces about 2.3 animal-unit-months per acre or about 1.4 tons of hay. Under a high level of management, Coastal bermudagrass yields about 6.0 animal-unit-months per acre or about 3.6 tons of hay, and common bermudagrass yields about 4.5 animal-unit-months per acre, or about 2.7 tons of hay.

PASTURE AND HAYLAND GROUP F

Trinity clay, frequently flooded, is the only soil in this capability unit. This deep, nearly level, calcareous soil occupies flood plains along the major streams and their tributaries, mainly in the eastern part of the county.

This soil receives runoff water from surrounding, higher soils. Because frequent flooding is likely, this soil is subject to washing and deposition of new soil material. When this soil is dry, it has cracks that extend to a depth of at least 20 inches. Water enters the cracks rapidly until this soil is wet. Then the cracks close, and movement of water into the soil is very slow. Surface runoff is very slow.

This soil is used for pasture and hay. Well-suited grasses are common and Coastal bermudagrasses, johnsongrass, and dallisgrass.

Under an average level of management, Coastal bermudagrass yields about 4.5 animal-unit-months of grazing per acre or about 2.7 tons of hay, and common bermudagrass yields about 3.6 animal-unit-months per acre or about 2.2 tons of hay. Under a high level of management, Coastal bermudagrass yields about 9.0 animal-unit-months per acre or 5.4 tons of hay, and common bermudagrass yields about 7.5 animal-unit-months per acre or about 4.5 tons of hay.

PASTURE AND HAYLAND GROUP H

This pasture and hayland group consists of soils in the Eddy, Ellis, and Stephen series. The Stephen soils are mapped in a complex with the Eddy soils in this group. These very shallow, moderately deep, and deep soils have a loamy or clayey surface layer. They are gently sloping to sloping and occupy uplands throughout the county.

Except for the Ellis soils, all the soils in this group are calcareous throughout the solum. Some of these soils are eroded. The very shallow and moderately deep soils are droughty during some periods.

Most of the acreage is pastured, because forage crops are not suited. If hay crops are grown, these soils require intense management. Common and Coastal bermudagrass, johnsongrass, and King Ranch bluestem are suitable grasses.

Under an average level of management, Coastal bermudagrass yields about 2.5 animal-unit-months of grazing per acre or about 1.5 tons of hay, and common bermudagrass yields about 2.0 animal-unit-months per acre or about 1.2 tons of hay per acre. Under a high level of management, Coastal bermudagrass yields about 3.6 animal-unit-months per acre or about 2.2 tons of hay, and common bermudagrass yields about 3.0 animal-unit-months per acre or about 1.8 tons of hay.

PASTURE AND HAYLAND GROUP I

This pasture and hayland group consists of deep, severely eroded, calcareous soils that have a loamy and clayey surface layer. These soils are in the Altoga and Lamar series. Also in this group are the Ferris and Houston soils, which are mapped as a complex. The soils in this group are sloping to strongly sloping and are on uplands, mainly in the eastern part of the county.

These soils are gullied, and the subsoil is exposed in many fields. Surface runoff is rapid. Because of erosion and runoff, vegetation is difficult to establish. These soils are used almost entirely for pasture, but forage plants do not grow well. Hay is not suited, because these soils are steep and eroded. The main grasses are johnsongrass, King Ranch bluestem, and common and Coastal bermudagrasses. The native vegetation is chiefly little bluestem, sideoats grama, and buffalograss.

298-732—68——4

Under an average level of management, Coastal bermudagrass yields about 2.0 animal-unit-months of grazing per acre, and common bermudagrass, about 1.5 animal-unit-months per acre. Under a high level of management, Coastal bermudagrass yields about 4.2 animal-unit-months of grazing per acre, and common bermudagrass, about 3.0 animal-unit-months of grazing per acre.

PASTURE AND HAYLAND GROUP J

This pasture and hayland group consists of deep, calcareous soils that have a loamy and clayey surface layer. These soils are in the Trinity and Frio series. They are nearly level and occur on flood plains along major streams and their tributaries, mainly in the eastern part of the county.

The soils in this group receive runoff water from surrounding, higher areas. The Frio soils are subject to frequent flooding, but the Trinity soils are flooded only occasionally. The Trinity soils have deep, wide cracks when they are dry, but water moves very slowly through them when they are wet. The Frio soils are moderately permeable.

The soils in this group are used for pasture and hay consisting mainly of johnsongrass, dallisgrass, and common and Coastal bermudagrasses.

Under an average level of management, Coastal bermudagrass yields about 4.5 animal-unit-months of grazing per acre or about 2.7 tons of hay, and common bermudagrass yields about 3.6 animal-unit-months or about 2.2 tons of hay. Under a high level of management, Coastal bermudagrass yields about 9.0 animal-unit-months per acre or about 5.4 tons of hay, and common bermudagrass yields 7.7 animal-unit-months per acre or about 4.6 tons of hay.

Use of the Soils for Engineering [3]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, structures for erosion control, drainage systems, and sewage disposal systems. Properties most important to engineers are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell potential, grain size, plasticity, and reaction (pH). Depth to the water table, depth to bedrock, and topography also are important.

The information in this survey can be used by engineers to—

1. Make studies of soil and land use that will aid in selecting and developing sites for industrial, business, residential, and recreational uses.
2. Make preliminary estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in the selection of locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected sites.
4. Locate probable sources of gravel and other material used in construction.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps, reports, and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The engineering interpretations in this subsection can be useful for many purposes, but it should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, however, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by the soil scientists may not be familiar to the engineer, and some terms may have a special meaning in soil science. Several of these terms are defined in the Glossary at the back of this survey.

Most of the information in this subsection is in tables 3, 4, and 5. Additional information on such subjects as recreational uses of the soils, sewage disposal, foundations for low buildings, and trafficways can be found in the subsection, "Use of the Soils for Community Development and Recreation."

Engineering classification systems

Most highway engineers classify soil materials according to the AASHO system (*1*). In this system, the soils are placed in seven basic groups, designated A–1 through A–7. In group A–1 are gravelly soils of high bearing capacity, or the best soils for road subgrade. In group A–7 are the poorest soils, clays that have low strength when wet. Groups A–1, A–2, and A–7 can be further divided to indicate more precisely the nature of the soil material. Within each group, the relative engineering value of the soil material may be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. Index numbers are shown in parentheses following the group symbol, for example, A–4(6).

In the Unified classification, the soils are grouped on the basis of their texture and plasticity and their performance as material for engineering structures. Soil materials are identified as gravels (G), sands (S), silts (M), clays (C), organic (O), and highly organic (Pt). Clean sands are identified by the symbols SW and SP; sands mixed with fines of silt and clay are identified by the symbols SM and SC; silts and clays that have a low liquid limit are identified by the symbols ML and CL; and silts and clays that have a high liquid limit are identified by the symbols MH and CH.

The United States Department of Agriculture classifies soils according to texture, which is determined by the proportion of sand, silt, and clay in the soil material (*7*). The terms "sand," "silt," and "clay" are defined in the Glossary at the back of this survey.

[3] By BEN J. PECENA, civil engineer, Soil Conservation Service.

Listed in table 3 are estimates of properties significant to engineering for each soil in Collin County. For some of the soils, the engineering classifications were estimated on the basis of test data in table 5 for the modal, or typical, profile. For those soils not listed in table 5, the estimates were based on test data obtained for similar soils, on data from field tests, and on data in the soil survey of Ellis County (*6*).

In the column headed "Hydrologic soil group," the soils are placed in one of four groups according to their ability to restrain runoff from a heavy storm after they have been thoroughly wetted. The groups range from tight clays (highest runoff potential—Group D) to open sands (lowest runoff potential—Group A).

Soils in group A have a high infiltration rate, even when thoroughly wetted. They have a high rate of water transmission and low runoff potential. The soils of this group are deep, are well drained or excessively drained, and consist chiefly of sand, gravel, or both. No soil in Collin County is in group A.

Soils in group B have a moderate infiltration rate when thoroughly wetted. Their rate of water transmission and their runoff potential are moderate. These soils are moderately deep or deep, moderately well drained or well drained, and fine to moderately coarse textured.

Soils in group C have a slow infiltration rate when thoroughly wetted. Their rate of water transmission is slow, and their potential runoff is high. These soils have a layer that impedes the downward movement of water, or they are moderately fine or fine textured and have a slow infiltration rate.

Soils of group D have a slow infiltration rate when thoroughly wetted. Their rate of water transmission is very slow, and runoff potential is very high. In this group are (1) clay soils with high shrink-swell potential; (2) soils with a permanent high water table; (3) soils with a claypan or clay layer at or near the surface; and (4) soils shallow over nearly impervious material.

In the columns under "Classification" the soil layers designated under "Depth from surface" are classified according to the USDA textural classification and the Unified and AASHO engineering classification.

The columns headed "Percentage passing sieve" list estimates for soil materials passing sieves of three sizes. This information is useful in helping to determine suitability of the soil as a source of material for construction purposes.

Permeability, as shown in table 3, is the estimated rate at which water moves through undisturbed soil material. The estimates are for each soil as it occurs in place without compaction.

Available water capacity, given in inches of water per inch of soil, is an estimate of the amount of water that a soil can hold. It is the approximate amount of capillary water in the soil when it is wetted to field capacity. If the soil is air dry, or at permanent wilting point of plants, the amount of water stated in table 3 will wet the soil material to a depth of 1 inch without deeper penetration. For example, a layer of Houston Black clay, 1 inch thick, will hold 0.18 inch of available water when wetted to field capacity.

In the column headed "Reaction" the degree of acidity or alkalinity is expressed in pH values. A pH of 7.0 is neutral; lower values indicate acidity, and higher values indicate alkalinity. Most of the soils in Collin County are alkaline.

Shrink-swell potential indicates how much the volume of a soil material changes as moisture content changes. A knowledge of this potential is important in planning the use of a soil for building roads and other engineering structures. Shrink-swell potential is rated *low*, *moderate*, *high*, and *very high*. In general, soils classified as CH and A–7 have a high shrink-swell potential, but deep, clayey soils such as Houston Black clay, are classified as CH and A–7–6 and have a very high shrink-swell potential. Clean sands and gravel (single grain) and sands and gravel having small amounts of nonplastic to slightly plastic fines have a low shrink-swell potential. Also low is the shrink-swell potential of most other nonplastic to slightly plastic soil materials. Eddy gravelly clay loam is an example of a soil that has a low shrink-swell potential.

The potential vertical rise (PVR) of clay soils is significant because vertical movement of soils affects buildings and roads. Factors that affect this rise are the plasticity index, amount of soil that will pass a No. 200 screen, and depth of soil to rock or nonswelling parent material. In table 3 the potential vertical rise is rated for each soil, and the range in rise is given in inches. The PVR figures are based on soil thickness of 6 feet, or if the soil is less than 6 feet thick, depth to bedrock.

Corrosion potential [4] depends on the physical, chemical, electrical, and biological characteristics of the soil; for example, concentrations of oxygen, concentrations of anaerobic bacteria, moisture content, and external factors, such as manmade electrical currents. Design and construction also have an influence. Occasionally, corrosion is intensified by connecting two dissimilar metals, by burying metal structures at varying depths, and by extending pipelines through different kinds of soils.

Although electrical resistivity is only one factor in corrosion, measurements of that property permit a classification of probable corrosion potential. Electrical resistivity is a measure of the resistivity of a soil to the flow of an electrical current when the soil is wet to field capacity. It is measured in ohms per cubic centimeter. A low value indicates low resistivity (or high conductivity) and a high corrosion potential. In table 3, corrosion potential of the soils in Collin County is rated *very high*, *high*, and *moderate* according to three ranges in electrical resistivity as follows:

Very high	0 to 750 ohms per cubic centimeter.
High	750 to 1,500 ohms per cubic centimeter.
Moderate	1,500 to 3,000 ohms per cubic centimeter.

Engineering interpretations of the soils

In table 4 the soils of Collin County are rated as sources of material for engineering uses. Also given are specific properties that affect the suitability of each soil as a site for engineering structures. Some of these properties are rated. The ratings were estimated on the basis of engineering test data in table 5, the engineering properties in table 3, and observations of field performance of the soils.

[4] Discussion of corrosion potential is based on information by C. W. TIPPS, Corrosion Engineer for City Public Service Board, San Antonio, Tex., and W. R. ELDER, Soil Conservation Service, Temple, Tex.

TABLE 3.—*Estimated*

Soil series and map symbols	Hydrologic soil group	Depth from surface	Classification		
			USDA texture	Unified [1]	AASHO [2]
		Inches			
Altoga (AlD2, AlE3)	B	0–25	Light silty clay	CH	A–7–6
		25–66	Silty clay	CL or CH	A–7–6 or A–6
Austin (AuB, AuC2, AuD2)	B	0–42	Silty clay	CH	A–7–6
		42–50	Chalky limestone.		
Burleson (BcA, BcB, BcB2)	D	0–75	Clay	CH	A–7–6
Crockett (CrC2, CrD2)	D	0–6	Light clay loam	CL or ML–CL	A–6 or A–7–6 or A–4
		6–52	Clay	CH	A–7–6
Eddy (EdB, EdD2)	C	0–5	Gravelly clay loam	CL	A–6
		5–30	Chalky limestone.		
Ellis (ElD2)	D	0–32	Clay	CH	A–7–5 or A–7–6
		32–34	Shale.		
Engle (EnB, EnC2)	C	0–48	Clay loam	CL	A–7–6
Ferris (FeE3) (For properties of the Houston soil in this mapping unit, refer to the Houston series.)	D	0–70	Clay	CH	A–7–6
Frio (Ff, Fo)	B	0–55	Clay loam	CL	A–6 or A–7–6
Houston (HcC2, HcD2)	D	0–60	Clay	CH	A–7–6
Houston Black (HoA, HoB, HoB2)	D	0–70	Clay	CH	A–7–6
Hunt (HuA, HuB)	D	0–52	Clay	CH	A–7–6
Lamar (LaC2, LaD2, LaE3)	C	0–46	Clay loam	CL	A–6 or A–7–6
Lewisville (LeB, LeC2)	B	0–16	Light silty clay	CH	A–7–6
		16–64	Silty clay	CL or CH	A–6 or A–7–6
Stephen (ScB, SeC2) (For properties of the Eddy soil in mapping unit SeC2, refer to the Eddy series.)	B	0–14	Silty clay	CH	A–7–6
		14–28	Chalky limestone.		
Trinity (Tf, To)	D	0–56	Clay	CH	A–7–6
Wilson (WcA, WcB)	D	0–7	Clay loam	CL	A–6
		7–60	Clay	CH or CL	A–7–6

[1] Based on the Unified Soil Classification System (7). Tech. Memo. No. 3–357, 2 v., Waterways Experiment Station, Corps of Engineers. Soils identified as ML–CL have borderline classification.

properties of the soils

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Potential vertical rise (PVR)	Corrosion potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)						
			Inches per hour	*Inches per inch of soil*	*pH*			
95–100	95–100	75–95	0. 2–0. 63	0. 18	7. 9–8. 4	High	Medium: 1.25 to 2.0 inches	High.
95–100	80–98	60–95	0. 2–0. 63	. 17	7. 9–8. 4	High		
98–100	90–98	85–95	0. 2–0. 63	. 18	7. 9–8. 4	High	Medium: 1.25 to 2.0 inches	Very high.
98–100	95–100	80–97	<0. 063	. 15	6. 1–7. 3	Very high	High: greater than 2.0 inches	Very high.
95–100	90–100	65–95	0. 063–0. 2	. 16	5. 6–7. 3	Moderate	Medium: 0.5 to 1.25 inches	High.
90–100	90–100	85–98	<0. 063	. 15	5. 6–7. 3	Moderate		
80–95	70–85	60–80	0. 2–0. 63	. 12	7. 4–8. 4	Low	Low: less than 0.5 inch	Moderate.
98–100	95–100	85–98	<0. 063	. 15	6. 6–8. 4	High	Medium: 1.25 to 2.0 inches	Very high.
90–100	85–100	50–70	0. 63–2. 0	. 14	7. 4–8. 4	Low	Low: less than 0.5 inch	High.
98–100	95–98	80–95	<0. 063	. 18	7. 4–8. 4	High	Medium: 1.25 to 2.0 inches	Very high.
98–100	95–100	70–85	0. 063–2. 0	. 13	7. 4–8. 4	High	Medium: 1.25 to 2.0 inches.	High.
98–100	95–100	70–98	<0. 063	. 18	7. 4–8. 4	Very high	High: greater than 2.0 inches.	Very high.
98–100	95–100	80–98	<0. 063	. 18	7. 4–8. 4	Very high	High: greater than 2.0 inches.	Very high.
98–100	95–100	80–98	<0. 063	. 18	6. 6–8. 4	Very high	High: greater than 2.0 inches.	Very high.
95–100	95–98	60–85	0. 63–2. 0	. 13	7. 9–8. 4	Low	Low: less than 0.5 inch	Moderate.
95–100	95–100	75–95	0. 2–0. 63	. 18	7. 9–8. 4	High	Medium: 1.25 to 2.0 inches	High.
95–100	80–98	60–95	0. 2–0. 63	. 17	7. 9–8. 4	High		
80–98	70–95	65–90	0. 2–0. 63	. 14	7. 4–8. 4	Moderate	Medium: 0.5 to 1.25 inches	High.
98–100	95–100	80–98	<0. 063	. 18	7. 4–8. 4	Very high	High: greater than 2.0 inches.	Very high.
95–100	95–100	75–90	0. 063–0. 2	. 13	5. 6–6. 5	High	Medium: 1.25 to 2.0 inches	High.
98–100	95–100	80–98	<0. 063	. 15	6. 1–8. 4	High		

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1; Ed. 7): The Classification of Soil and Soil Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145–49.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Soil properties affecting—	
	Topsoil	Road fill	Highway location	Farm ponds: Reservoir area
Altoga (AlD2, AlE3)	Fair	Poor	High shrink-swell potential; unstable material.	Gravel beds below a depth of 40 inches in some areas.
Austin (AuB, AuC2, AuD2)	Fair	Poor	Unstable material; high shrink-swell potential.	Moderately slow permeability; surface layer needs core; chalk and marl at a depth of 2.5 to 5 feet.
Burleson (BcA, BcB, BcB2)	Fair	Poor	Very high shrink-swell potential; unstable material.	Very slow permeability
Crockett (CrC2, CrD2)	Fair in surface layer.	Poor	Moderately to highly erosive when exposed on embankments.	Very slow permeability
Eddy (EdB, EdD2)	Poor	Poor	Chalky limestone within a depth of 3 to 8 inches.	Chalky limestone within a depth of 3 to 8 inches.
Ellis (ElD2)	Poor	Poor	Shale within a depth of 25 to 40 inches; high shrink-swell potential.	Very slow permeability; shale within a depth of 25 to 40 inches.
Engle (EnB, EnC2)	Fair	Fair	Weakly cemented, calcareous sandstone at a depth of 30 to 50 inches.	Moderate permeability; soft sandstone within a depth of 30 to 50 inches; high seepage potential.
Ferris (FeE3) (For interpretations of Houston soil in this mapping unit, refer to the Houston series.)	Poor	Poor	Very plastic material; high shrink-swell potential.	Very slow permeability; slopes of 5 to 12 percent.
Frio (Ff, Fo)	Good	Poor	High shrink-swell potential; occasional to frequent flooding.	Moderate permeability; excessive seepage; occasional to frequent flooding.
Houston (HcC2, HcD2)	Fair	Poor	Very plastic material; very high shrink-swell potential; material highly erosive when exposed on embankments.	Chalk or chalky marl at a depth of 30 to 50 inches in some areas.
Houston Black (HoA, HoB, HoB2)	Fair	Poor	Very high shrink-swell potential; very plastic.	Very slow permeability
Hunt (HuA, HuB)	Fair	Poor	Very high shrink-swell potential; very plastic.	Very slow permeability
Lamar (LaC2, LaD2, LaE3)	Good	Fair	Material highly erosive when exposed on embankments.	Moderately slow permeability; excessive seepage; weakly cemented calcareous sandstone at a depth of 5 to 8 feet.
Lewisville (LeB, LeC2)	Fair	Poor	High shrink-swell potential	Moderately slow permeability; excessive seepage; gravel beds or sandy loam alluvium at a depth of 3 to 15 feet.
Stephen (ScB, SeC2) (For interpretations of Eddy soil in mapping unit SeC2, refer to the Eddy series.)	Fair in surface layer.	Poor	Chalky limestone at a depth of 8 to 20 inches.	Chalky limestone at a depth of 8 to 20 inches; excessive seepage.
Trinity (Tf, To)	Fair	Poor	Very high shrink-swell potential; occasional and frequent flooding.	Very slow permeability; occasional and frequent flooding.
Wilson (WcA, WcB)	Fair in surface layer.	Poor	High shrink-swell potential	Very slow permeability

interpretations of soils

Soil properties affecting—Continued			
Farm ponds—Continued	Irrigation	Terraces and diversions	Waterways
Embankments			
Fair stability if slopes are flat	Sloping to steep soils; moderately slow intake rate.	Slopes of 5 to 12 percent	High erodibility; steep slopes.
Fair stability if slopes are flat; high lime content.	Moderately slow intake rate; gently sloping to sloping.	Soil properties favorable	Soil properties favorable.
Fair stability if slopes are flat; very high shrink-swell potential.	Very slow intake rate	Soil properties favorable	Soil properties favorable.
Fair stability if slopes are flat	Moderately sloping to sloping soils; very slow intake rate.	Soil properties favorable	Hazard of erosion; soils crust when dry; dense clayey subsoil.
Coarse fragments of chalk; fair stability.	Very shallow soils	Very shallow soils; chalky limestone at a depth of 3 to 8 inches.	Very shallow soils; chalky limestone at depth of 3 to 8 inches.
Fair stability; poorly graded; cracks when dry; high shrink-swell potential.	Sloping soil; very slow intake rate.	Soil properties favorable; slopes of 3 to 8 percent.	Very slow permeability; difficult to establish vegetation.
Low shrink-swell potential; fair stability.	Moderate intake rate and available water capacity.	Soil properties favorable	Soil properties favorable.
Fair stability if slopes are flat; high shrink-swell potential.	Very slow rate of intake; sloping to strongly sloping soils.	Slopes of 5 to 12 percent	High erodibility; sloping to strongly sloping soils.
Soil properties favorable	Moderate rate of intake; occasional to frequent flooding.	Occasional and frequent flooding.	Occasional to frequent flooding; siltation hazard.
Fair stability if slopes are flat; very high shrink-swell potential.	Very slow rate of intake; moderately sloping to sloping soils.	Soil properties favorable	Soils crack when dry; highly erodible.
Fair stability if slopes are flat; very high shrink-swell potential.	Very slow rate of intake	Soil properties favorable	Soils crack when dry.
Fair stability if slopes are flat	Very slow rate of intake	Soil properties favorable	Soils crack when dry.
Fair stability	Moderately slow rate of intake; moderately sloping to strongly sloping soils.	Slopes of 3 to 12 percent	Low fertility; moderately to strongly sloping soils; highly erodible.
Fair stability if slopes are flat	Moderately slow rate of intake.	Soil properties favorable	Soil properties favorable.
Fair stability	Shallow soils; low available water capacity.	Shallow; chalky limestone at a depth of 8 to 20 inches.	Shallow soil; chalky limestone at a depth of 8 to 20 inches; droughty.
Fair stability if slopes are flat; very high shrink-swell potential.	Very slow rate of intake; occasional and frequent flooding.	Nearly level soils; occasional and frequent flooding.	Occasional and frequent flooding; siltation hazard.
Fair stability if slopes are flat; high shrink-swell potential.	Very slow rate of intake	Soil properties favorable	Cuts may expose dense, clayey subsoil; rapid runoff.

TABLE 5.—

[Tests performed by the Texas Highway Department in accordance with standard procedures of the American Association of State High- Department of Commerce,

Soil name and location	Parent material	Texas report No.	Depth	Shrinkage		
				Limit	Lineal	Ratio
			Inches			
Austin silty clay:						
4.5 miles northwest of State Highway 24 and 159 feet south of Farm-to-Market Road 1461. (Modal)	Austin chalk.	63–361–R	5–15	16	18. 0	1. 82
		63–362–R	15–33	14	17. 5	1. 85
		63–363–R	33–42	18	14. 8	1. 76
Burleson clay:						
2.3 miles south of northwest corner of Collin County and 150 feet in field. (Slightly less clayey in A12 horizon than modal)	Calcareous clays and marls.	63–351–R	22–23	8	19. 6	2. 09
		63–352–R	49–64	9	21. 2	2. 04
		63–353–R	78–96	10	20. 7	2. 05
Crockett soils:						
0.9 mile south of Grayson County line and 0.1 mile east of State Highway 289. (Modal)	Acid shales and calcareous marls.	63–370–R	0–9	20	4. 5	1. 66
		63–371–R	9–25	14	16. 1	1. 87
		63–372–R	47–56	16	14. 4	1. 83
Engle clay loam:						
0.55 mile south of Texas Highway 78 and 120 feet west of Farm-to-Market Road No. 6.	Calcareous sandstone.	63–364–R	6–17	14	15. 0	1. 87
		63–365–R	17–32	14	12. 8	1. 86
		63–366–R	32–50	13	13. 6	1. 88
Frio clay loam:						
6.0 miles northeast of Texas Highway 24 and 0.4 mile east of Farm-to-Market Road 1827 and 50 feet south of road. (Modal)	Stratified calcareous clay loam alluvium.	63–368–R	20–39	14	13. 4	1. 87
3.6 miles east of U.S. Highway 75 and 0.6 mile north of Texas Highway 24. (Grayer than modal)	----------	63–369–R	18–36	12	16. 1	1. 93
Houston Black clay:						
1.6 miles north of Farm-to-Market Road 1778 and 0.9 mile east of Farm-to-Market Road 547. (Modal)	Taylor marl.	63–376–R	6–26	11	28. 3	1. 96
		63–377–R	26–36	11	29. 2	2. 02
		63–378–R	36–50	11	30. 3	1. 97
Houston clay:						
1.5 miles northeast of Princeton from Texas Highway 24 and 80 feet south of Farm-to-Market Road 1377. (Modal)	Taylor marl.	63–379–R	5–15	10	23. 0	1. 99
		63–380–R	15–28	13	21. 0	1. 93
		63–381–R	28–48	12	22. 3	1. 94
Lewisville silty clay:						
0.1 mile east of east turn to Lake Lavon and 50 feet north of road on Texas State Highway 78. (Modal)	Calcareous alluvium.	63–357–R	0–12	12	18. 6	1. 94
		63–358–R	12–36	11	17. 3	2. 01
		63–359–R	36–60	10	18. 3	2. 04
Trinity clay:						
0.6 mile south of East Fork Baptist Church and 1.6 miles south and 100 feet east in field. (Modal)	Stratified calcareous clayey alluvium.	63–360–R	5–20	13	18. 4	1. 93
100 feet northwest from Wilson Creek bridge on State Highway 24. (Modal)	----------	63–367–R	16–30	14	18. 0	1. 88

[1] Mechanical analyses according to the AASHO Designation T 88–59 (*1*). Results obtained by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes of soil.

Engineering test data

way Officials (AASHO) (*1*). The work by the Highway Department was performed under a cooperative agreement with the U.S. Bureau of Public Roads]

Mechanical analysis [1]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—				Percentage smaller than—					AASHO [2]	Unified [3]
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.				
[4] 99	98	95	93	91	67	50	61	38	A–7–6(20)	CH
100	99	97	94	94	75	59	56	33	A–7–6(9)	CH
100	99	94	91	89	71	56	53	33	A–7–6(18)	CH
100	100	99	87	82	53	33	52	33	A–7–6(18)	CH
99	98	98	89	83	56	50	60	40	A–7–6(20)	CH
99	98	97	88	83	58	45	59	41	A–7–6(20)	CH
100	99	96	66	48	16	12	28	7	A–4(6)	ML–CL
99	96	90	88	82	55	50	52	31	A–7–6(18)	CH
97	95	93	91	89	50	42	48	30	A–7–6(18)	CL
99	99	98	66	59	37	32	48	28	A–7–6(15)	CL
96	93	87	61	55	39	30	42	26	A–7–6(11)	CL
98	95	91	62	58	40	33	42	27	A–7–6(12)	CL
100	100	96	80	75	46	37	43	25	A–7–6(15)	CL
100	98	76	73	72	53	39	48	28	A–7–6(15)	CL
100	100	95	94	94	74	65	98	72	A–7–6(20)	CH
100	98	92	91	91	72	64	100	74	A–7–6(20)	CH
98	95	89	87	87	75	67	110	86	A–7–6(20)	CH
100	99	73	72	72	58	50	70	45	A–7–6(19)	CH
100	99	70	69	69	58	50	66	45	A–7–6(18)	CH
100	96	86	85	85	73	64	70	48	A–7–6(20)	CH
100	100	82	81	77	50	39	55	35	A–7–6(19)	CH
100	99	73	72	70	46	35	49	31	A–7–6(18)	CL
100	98	93	92	91	60	46	51	34	A–7–6(18)	CH
100	99	85	83	82	53	40	56	37	A–7–6(19)	CH
100	100	97	90	85	50	40	57	36	A–7–6(19)	CH

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145–49 (*1*).

[3] Based on the Unified Soil Classification System, Waterways Experiment Station, Corps of Engineers, March 1953 (*7*). Soil Conservation Service and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of a borderline classification is ML–CL.

[4] 100 percent of material passes a ¾-inch sieve.

Most of the soils in Collin County are rated fair as a source of topsoil. Topsoil is fertile soil material used to topdress areas where vegetation is to be grown, such as roadbanks, dams, ditch lines, gardens, and lawns. Ordinarily topsoil is rich in organic matter. Normally, only the surface layer is used for topsoil, but other layers are also suitable sources. The loamy and fertile Frio soils are good sources of topsoil, but the Eddy soils are poor sources of topsoil because they are very shallow and gravelly.

Most of the soils in the county are rated poor as a source of road fill. Road fill is soil material useful for building up road subgrades for supporting base layers. The suitability of a soil for road fill depends largely on its texture, plasticity, shrink-swell potential, traffic-supporting capacity, susceptibility to erosion, compaction characteristics, and natural water content. Clayey soils, such as Burleson clay, Houston Black clay, and Hunt clay, provide poor sources of road fill because they have a very high shrink-swell potential and are difficult to place and compact.

Most of the soils in the county are clayey and are not suited as sources of sand or gravel. The Altoga, Frio, Lewisville, and Trinity soils, however, provide sources of sand and gravel at depths of 5 to 20 feet.

Soil features listed in the remaining columns, such as those affecting highway location, were selected on the basis of the estimated soil classification. Soils that have a plastic clay layer, such as Houston Black clay and Hunt clay, have a very high shrink-swell potential and are poorly suited as locations for highways.

Frio clay loam and other soils that are frequently flooded do not provide good reservoir areas. Austin soils are unsuitable as reservoir areas, because they have a chalky substratum through which water seeps. Houston clay and Hunt clay are difficult to stabilize when they are used for embankments because they have a high shrink-swell potential and crack when dry. Reservoir areas and embankments for farm ponds are also impaired by frequent flooding, stoniness, bedrock near the surface, and highly permeable soil material.

The suitability of the soils for irrigation depends largely on rate of water intake, water-holding capacity, soil depth, slope, susceptibility to water erosion, and the flooding hazard. For example, it is risky to irrigate fields of Frio clay loam, frequently flooded, because flooding is frequent.

Among the soil features that affect the suitability of a soil for terraces or diversions are slope, depth to bedrock or other unfavorable material, texture, and stability of soil material. On steep, erodible, clayey soils, field terraces are difficult to construct and maintain. For example, Houston clay is unsuitable for field terraces, because it cracks when dry and has a very high shrink-swell potential; also, diversion terraces built on Frio clay loam, frequently flooded, may be damaged or destroyed by frequent floods.

Grassed waterways are used on soils to carry off water discharged from terrace outlets, diversion outlets, and other areas. Soils that are shallow over chalky limestone are poorly suited as sites for grassed waterways because the limestone makes construction difficult. Also, these shallow soils are droughty, and vegetation on them is difficult to establish. The Eddy soils and Stephen soils are examples of soils that are shallow over chalky limestone. Frequent flooding is another feature that makes it difficult to establish waterways, for the floodwaters kill the plants in the waterways or slow their growth.

Engineering test data

Table 5 gives the engineering test data for samples of the soils of nine series in Collin County. The tests were performed by the Texas State Highway Department according to standard procedures of the American Association of State Highway Officials. The test data for the soil samples indicate the engineering characteristics of the soil at the specific location given in table 5. These same soils will probably have similar characteristics at other sites in the county. Both the AASHO and the Unified systems of engineering classifications are also given.

The engineering soil classifications are based on data obtained by mechanical analyses and by tests to determine the liquid limit and the plastic limit. The *plastic limit* is the moisture content at which the soil material passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the material passes to a liquid state. The *plasticity index* is the numerical difference between the plastic limit and the liquid limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

As moisture is removed from a soil, the volume of the soil decreases, in direct proportion to the loss of moisture, until a condition of equilibrium, called the *shrinkage limit*, is reached. Beyond the shrinkage limit, more moisture may be removed, but the volume of soil does not change. In general, the lower the shrinkage limit, the higher the content of clay. *Lineal shrinkage* is the decrease in one dimension of the soil mass that occurs when the moisture content is reduced from a stipulated percentage to the content at shrinkage limit. Lineal shrinkage is expressed as a percentage of the original dimension.

The *shrinkage ratio* is the volume change resulting from the drying of soil material, divided by the loss of moisture caused by drying. The ratio is expressed numerically.

Use of the Soils for Community Development and Recreation

The population in and around Collin County is continuing to grow as a part of the Dallas metropolitan area, and the building of nonfarm structures on the soils of the county is greatly increasing. This building and the accompanying extension of public utilities and establishment of business and recreational facilities create a need for soils information that is somewhat different from the information needed for farm purposes. Realtors, city planners, builders, and others need facts that help them to know the sites that are suitable for homes or other buildings and the sites that should be reserved for other uses.

Table 6 rates the degrees and lists the kinds of limitations of each soil in the county for specified uses in community development and as recreational facilities. The limitations are *slight*, *moderate*, and *severe*. A rating of *slight* indicates that the soil has few limitations, if any, and that they are easy to overcome. A rating of *moderate* indicates that normally it is feasible to overcome the soil limitations. A rating of *severe* shows that use of the soil is questionable because the limitations are difficult to overcome.

The interpretations in table 6 do not eliminate the need for sampling and testing the soil at a proposed site. The interpretation should be used as a basis for planning more detailed field investigations so that the condition of the soil in place can be determined before a site is put to a specific use. By using the soil map to identify the soils in an area of interest and then referring to the ratings in table 6, the reader can get a general idea of the limitations of the different soils for specific uses.

Use of soils for community development

Expansion of community development in Collin County has been into many areas that are not well suited to buildings and other structures. Planners, builders, and maintenance men have met costly failures that can be traced to mistakes made in selecting soils for proposed structures, or to a lack of information about the soils that were used. Table 6 has been prepared to assist in avoiding these failures. Discussed in the following paragraphs are limitations and use of soils for sewage disposal, foundations for low buildings, and trafficways.

A septic tank filter field disposes of sewage by absorption. In a filter field, subsurface tile is laid in such a way that effluent from the septic tank is distributed with reasonable uniformity into the natural soil. In an efficient system, soil material is required that is permeable enough to permit moderate to rapid percolation of the effluent. Some soils are not suitable as filter fields, because they are susceptible to flooding. Trinity soils are of this kind, and they are further limited by very slow permeability and very high shrink-swell potential. Depth to hard rock, slope, and depth to water table are limitations on other soils.

A sewage lagoon is a shallow lake that holds sewage for the time required for bacterial decomposition. The soils used for lagoons should be suitable as a floor for the impounded area and as material for the dam. The effectiveness of a lagoon depends largely on soil permeability, soil depth, and steepness of slope. Also important are the hazard of flooding and nearness to streams or other bodies of water. As shown in table 6, the Austin soils are moderately limited as sites for sewage lagoons. Their subsoil is moderately slow in permeability and their chalky substratum permits seepage.

The column headed "Foundations for low buildings" in table 6 refers to buildings not more than three stories high. These buildings are residences or they are stores, offices, and small industries. They generally are in areas where public or community facilities for sewage disposal are available. Important properties in evaluating limitations of the soils used for foundations for low buildings are slope, flood hazard, soil depth, shrink-swell potential, and bearing capacity. The Burleson and Hunt soils, for example, have a *very high* shrink-swell potential and *low* bearing capacity; they are severely limited as sites for low building foundations. In evaluating the soils, engineers and others should not apply specific values to the estimates given in this survey for bearing capacity of soils.

Trafficways refer to the use of soils for low-cost roads and residential streets. Their construction requires limited cut and fill and limited preparation of subgrade. Most of the soils in Collin County are severely limited for use as trafficways. The dominant adverse feature is traffic-supporting capacity. Traffic-supporting capacity is the ability of the undisturbed soil to support moving loads, and it indicates whether the soil is desirable as subgrade material. The characteristics of undisturbed soil and of disturbed soil when carefully compacted are similar.

Many of the soils in Collin County contain an abundance of the clay mineral montmorillonite and are not suitable for building foundations. Soils of this kind swell when wet and shrink and crack when dry. This action creates such pressure on walls and foundations that they are likely to crack unless specially reinforced. This change in volume in a soil material as moisture content changes is called the shrink-swell potential (see table 3). The Burleson, Houston, Houston Black, Hunt, and Trinity soils are risky for building foundations or for pipelines because they have a very high shrink-swell potential.

Most of the soils of Collin County are not well suited to gardening and landscaping, for they are not well suited to vegetables, flowers, shrubs, and trees. Those soils that contain a large amount of clay can be improved by mixing sand and organic matter, such as peat moss, into the surface layer so as to prevent cracking and to increase the movement of water, air, and roots.

Different kinds of plants require different degrees of acidity or alkalinity. Roses and most annual flowers, most vegetables, and most grasses generally grow best in soils that are neutral (noncalcareous) or only slightly acid. Azaleas, camellias, and similar plants need acid soils. Some plants grown on soils high in lime, such as the Austin, Stephen, and Houston soils, develop a disease called chlorosis, or yellowing of the leaves. But many flowers, shrubs, and trees are well suited to the limy (calcareous) soils in Collin County. Some of these flowers are shasta daisies, hollyhocks, petunias, zinnias, and gladiolus. Crapemyrtle, dogwood, pecan, and fruitless mulberry are some of the shrubs and trees.

Use of soils for recreational development

Outdoor recreational activities are increasing in Collin County, especially boating, water skiing, fishing, swimming, and picnicking on and around Lake Lavon and other lakes. Landowners have opened to the public areas that include floodwater-retarding structures, and they charge a fee for fishing, boating, and picnicking (fig. 20). Collin County has a high potential for developing hunting, fishing, or other recreational facilities. Information on developing wildlife habitats and in managing fish ponds can be obtained from the Texas Agricultural Extension Service, the Texas Parks and Wildlife Department, and the Soil Conservation Service.

In table 6 the degree and kind of limitation is given for each soil in the county used for intensive camp areas and play areas, picnic areas, and paths and trails.

Intensive camp areas are areas suitable as sites for tents and camp trailers for periods of at least 1 week. Septic tanks are not required, and the site should need little preparation. Intensive play areas are used as playgrounds and for games such as baseball, football, and badminton. Because these areas are subject to intensive foot traffic, they require good trafficability. The soils should be nearly level and have a firm surface and good drainage. The Altoga, Austin, and Ferris soils are some of the soils severely limited as sites for camp and play areas because of their poor trafficability and slope.

TABLE 6.—*Limitations of soils for building*

Soil series and map symbols	Degree and kind of limitation for—		
	Sewage disposal		Foundations for low buildings
	Filter fields	Lagoons	
Altoga (AlD2, AlE3)	Severe: Moderately slow permeability; slopes of 5 to 12 percent.	Severe: Slopes of 5 to 12 percent.	Severe: High shrink-swell potential; low bearing capacity; slopes of 5 to 12 percent.
Austin (AuB, AuC2, AuD2)	Severe: Moderately slow permeability.	Moderate: Moderately slow permeability; excess seepage; bedrock at depths of 30 to 60 inches.	Severe: High shrink-swell potential; low bearing capacity.
Burleson (BcA, BcB, BcB2)	Severe: Very slow permeability.	Slight	Severe: Very high shrink-swell potential; low bearing capacity.
Crockett (CrC2, CrD2)	Severe: Very slow permeability.	Moderate: Slopes of 2 to 8 percent.	Severe: Moderate shrink-swell potential.
Eddy (EdB, EdD2)	Severe: Very shallow over chalky limestone.	Severe: Very shallow over chalky limestone.	Moderate: Very shallow over chalky limestone.
Ellis (ElD2)	Severe: Very slow permeability; compact shale at depths of 2 to 4 feet.	Moderate: Slopes of 3 to 8 percent.	Severe: High shrink-swell potential; low bearing capacity.
Engle (EnB, EnC2)	Slight to moderate: Weakly cemented sandstone at depths of 30 to 50 inches.	Moderate: Moderate permeability; seepage; weakly cemented sandstone at depths of 30 to 50 inches.	Severe: Low bearing capacity
Ferris (FeE3) (For limitations of Houston soil in this mapping unit, refer to the Houston series.)	Severe: Very slow permeability.	Severe: Slopes of 5 to 12 percent.	Severe: High shrink-swell potential.
Frio (Ff, Fo)	Severe: Frequent to occasional hazard of flooding; moderate permeability.	Severe: Moderate permeability; frequent to occasional hazard of flooding.	Severe: High shrink-swell potential; hazard of flooding.
Houston (HcC2, HcD2)	Severe: Very slow permeability.	Moderate: Slopes of 3 to 8 percent.	Severe: Very high shrink-swell potential.
Houston Black (HoA, HoB, HoB2).	Severe: Very slow permeability.	Slight	Severe: Very high shrink-swell potential.
Hunt (HuA, HuB)	Severe: Very slow permeability.	Slight	Severe: Very high hrink-swell potential.
Lamar (LaC2, LaD2, LaE3)	Slight to moderate: Weakly cemented sandstone at depths of 5 to 8 feet.	Moderate to severe: Moderate permeability; slopes of 3 to 12 percent.	Moderate: Slopes of 3 to 12 percent.
Lewisville (LeB, LeC2)	Severe: Moderately slow permeability.	Slight to moderate: Slopes of 1 to 5 percent.	Severe: High shrink-swell potential; low bearing capacity.
Stephen (ScB, SeC2) (For limitations of Eddy soil in mapping unit SeC2, refer to the Eddy series.)	Severe: Moderately slow permeability; chalky limestone at depths of 8 to 20 inches.	Severe: Excess seepage; chalky limestone at depths of 8 to 20 inches.	Severe: Moderate shrink-swell potential; shallow over chalky limestone.
Trinity (Tf, To)	Severe: Very slow permeability; frequent to occasional flooding.	Severe: Frequent to occasional flooding.	Severe: High shrink-swell potential; frequent to occasional flooding.
Wilson (WcA, WcB)	Severe: Very slow permeability.	Slight	Severe: High shrink-swell potential; low bearing capacity.

sites, trafficways, and recreational uses

Degree and kind of limitation for—Continued			
Trafficways	Intensive camp and play areas	Picnic areas	Paths and trails
Severe: Poor traffic–supporting capacity.	Severe: Poor trafficability; slopes of 5 to 12 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Poor traffic–supporting capacity.	Severe: Poor trafficability; slopes of 1 to 8 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic–supporting capacity.	Severe: Very slow permeability; poor trafficability.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic–supporting capacity.	Severe: Very slow permeability; slopes of 3 to 8 percent.	Moderate: Fair trafficability	Moderate: Fair trafficability.
Slight to moderate: Very shallow over chalky limestone.	Severe: Very shallow over chalky limestone; slopes of 1 to 8 percent; fair trafficability.	Slight	Severe: Fair trafficability; very shallow over chalky limestone.
Severe: Very poor traffic-supporting capacity.	Severe: Poor trafficability; slopes of 3 to 8 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Moderate: Fair traffic-supporting capacity.	Slight	Slight	Slight.
Severe: Very poor traffic-supporting capacity.	Severe: Poor trafficability; slopes of 5 to 12 percent.	Severe: Poor trafficability	Severe: Poor trafficability; slopes of 5 to 12 percent.
Severe: Fair traffic-supporting capacity; flood hazard.	Severe: Fair trafficability; susceptibility to flooding.	Severe: Fair trafficability; susceptibility to flooding.	Severe: Fair trafficability; susceptibility to flooding.
Severe: Very poor traffic-supporting capacity.	Severe: Poor trafficability; slopes of 3 to 8 percent.	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic-supporting capacity.	Severe: Poor trafficability	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Very poor traffic-supporting capacity.	Severe: Poor trafficability	Severe: Poor trafficability	Severe: Poor trafficability.
Moderate: Fair traffic-supporting capacity.	Moderate: Fair trafficability; slopes of 3 to 12 percent.	Moderate: Fair trafficability	Moderate: Fair trafficability.
Severe: Poor traffic-supporting capacity.	Severe: Poor trafficability	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Poor traffic-supporting capacity; chalky limestone at depths of 8 to 20 inches.	Severe: Poor trafficability	Severe: Poor trafficability	Severe: Poor trafficability.
Severe: Poor traffic-supporting capacity.	Severe: Poor trafficability; susceptibility to flooding.	Severe: Poor trafficability; susceptibility to flooding.	Severe: Poor trafficability; susceptibility to flooding.
Severe: Very poor traffic-supporting capacity.	Severe: Fair trafficability; very slow permeability.	Moderate: Fair trafficability	Moderate: Fair trafficability.

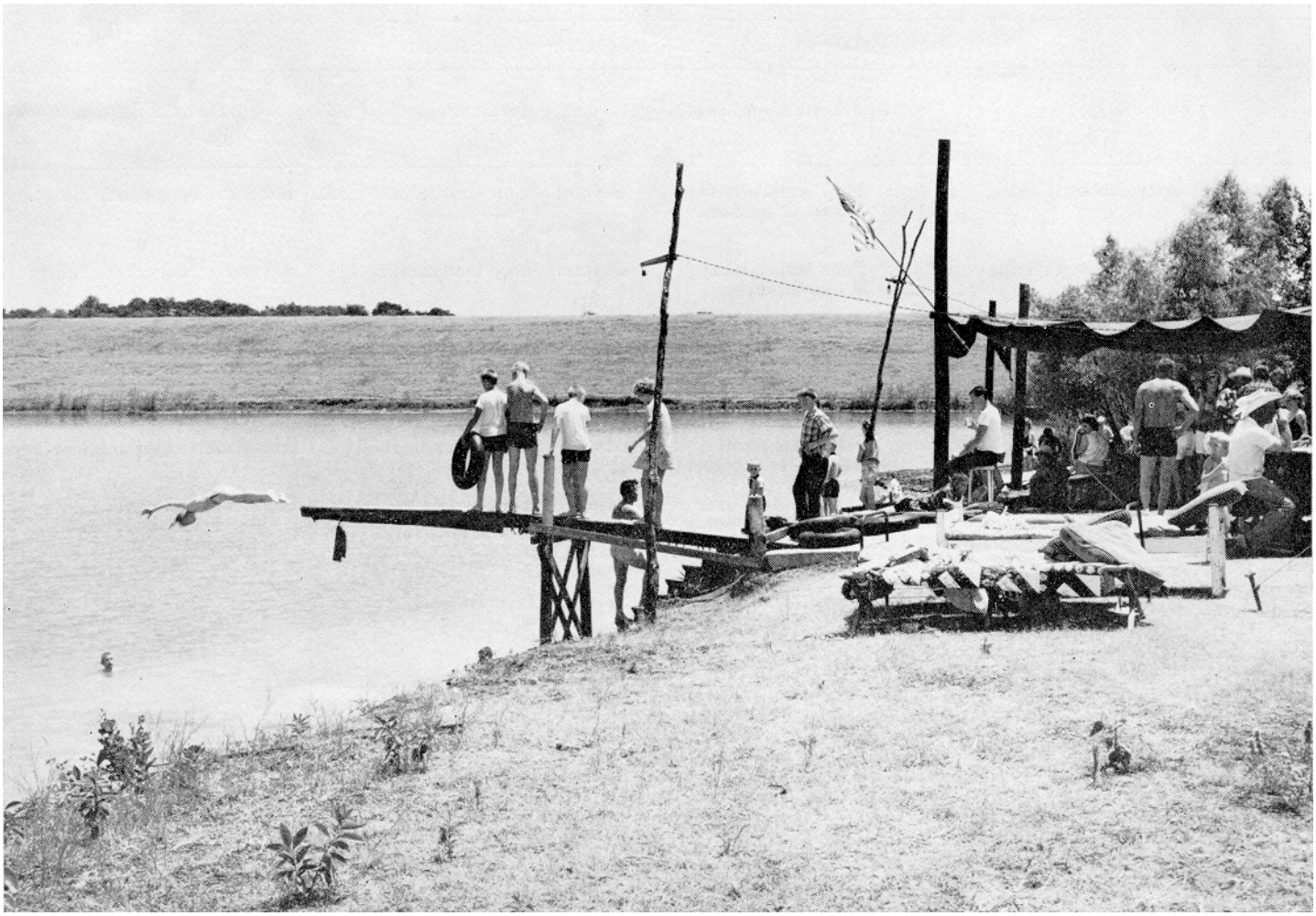

Figure 20.—**Part of a floodwater-retarding structure used for recreational purposes. This structure was built in an area of Altoga silty clay, 5 to 8 percent slopes, eroded.**

Important properties in evaluating soils used for picnic areas are trafficability, flood hazard, and slope. The Trinity soils, for example, are severely limited as sites for picnic areas because they support foot traffic poorly and are likely to be flooded. In table 6 the ratings for picnic areas are based only on soil properties and do not include the presence of trees, lakes, or other features that may affect a site.

Paths and trails refer to the uses of soils for trails, cross-country hiking, bridle paths, and the random movement of people. Most of the soils in the county have moderate or severe limitations as sites for paths or trails, mainly because of trafficability. Trafficability, if applied to paths and trails, refers to the ease with which people move about on foot, on horseback, or in small vehicles.

Formation and Classification of Soils

This section discusses the effects of major factors of soil formation on the formation of soils in Collin County and briefly describes important processes in the differentiation of soil horizons. Also, the current system of soil classification is explained, and each soil series represented in the county is placed in some of the categories in that system. Physical and chemical data for the Burleson, Houston Black, and Stephen series will be published in a Soil Survey Interpretations report in the near future.

Factors of Soil Formation

Soil is the product of the interaction of the five major factors of soil formation. They are climate, living organisms (especially vegetation), parent material, relief, and time. If a factor, such as climate or vegetation, varies from place to place, different kinds of soils form.

Climate

The climate of Collin County is warm temperate, subtropical, and humid. It is believed to be similar to the climate that existed when the soils were formed. This climate has encouraged profile development in the Wilson, Crockett, and similar soils. Because the climate is uniform throughout the county, differences in the soils are not the result of the effects of climate.

Living organisms

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. They add to the supply of organic matter and nitrogen in the soil and cause gains or losses in plant nutrients. Living organisms change soil structure and help to increase porosity in places where they disturb the soil.

Vegetation, dominantly tall and mid grasses, has affected soil formation more than other living organisms. This vegetation was effective in contributing to the accumulation of organic matter and in darkening the soils.

Parent material

Parent material is the unconsolidated soil mass from which the soils were formed. It determines the limits of the chemical and mineralogical composition of the soil. In Collin County soils developed from material in three geological systems. These are the Upper Cretaceous, Quaternary, and Recent. In the Upper Cretaceous system are Eagle Ford shale, Austin chalk, Taylor marl, and Neylandville marl.

Eagle Ford shale underlies the entire county and is near the surface in the northwestern part of the county. The shale is dark bluish gray to nearly black when exposed. It weathers readily and forms dark clayey soils. The Burleson, Crockett, Wilson, and Ellis soils are the dominant soils that formed over Eagle Ford shale.

Austin chalk overlies Eagle Ford shale and consists of alternating beds of chalk, chalky limestone, and thin seams of marl. This formation is several hundred feet thick. Most of the soils that formed over this chalk are calcareous, granular, and crumbly. Deep soils that formed over the chalk are in the Austin, Houston Black, and Houston series. Shallow soils that formed in chalk are in the Eddy and Stephen series.

The Taylor formation overlies Austin chalk in the eastern part of the county. The members of this formation in the county are Taylor marl, Wolfe City sand, and Pecan Gap chalk.

Dominant in the Taylor formation is Taylor marl, which is a mixture of clays and calcium carbonate. It weathers easily and forms dark, clayey soils. Houston Black, Houston, Hunt, Burleson, and Wilson are the main soils formed over Taylor marl.

Wolfe City sand is a narrow band of fine, calcareous, gray to yellow sand 75 to 100 feet thick. It enters the county northeast of Farmersville and extends from the southern boundary of the county into Rockwall County. Lamar and Engle soils formed in areas where the sand is exposed.

Pecan Gap chalk also occurs in a narrow band and parallels the east side of the Wolfe City formation. This sandy chalk is exposed in only a few areas, and in these areas the substratum is slightly lighter colored than it is where Pecan Gap chalk is not exposed. The dominant soils formed from Pecan Gap chalk are the Houston Black and Houston soils.

Neylandville marl, in the southeastern corner of the county, is less calcareous than the Taylor marl. The Burleson, Houston Black, and Wilson soils formed in areas of Neylandville marl.

Along the streams are Quaternary deposits that were laid down chiefly during the Pleistocene era. Some of these deposits are smooth and are the parent material of the Burleson and Houston Black soils. Others are sloping and are the parent material of Altoga and Lewisville soils.

Recent formations consist of alluvial deposits on flood plains along the major streams and their tributaries. These deposits are calcareous loamy and clayey material. Examples of soils formed in this material are the Frio and Trinity.

Relief

Relief affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. In much of Collin County the soils have slopes of less than 3 percent. Northeast of Farmersville and in some areas near streams, the soils have slopes of as much as 12 percent. Erosion is moderate to severe on the steeper soils where they are not protected, and it has affected soil formation. Soils once classified as Houston soils have been eroded to the extent that the original dark grayish-brown upper layer has been removed, and the profile is lighter colored. These lighter colored soils are now classified as Ferris soils.

Houston Black soils formed in nearly level areas that have slow but adequate drainage and have black horizons that extend to a depth of more than 40 inches. The plant cover is thin in many areas of steep soils. This thin cover increases susceptibility to erosion and retards soil formation.

Soil temperature varies slightly according to position of the slopes. During summer, soils on slopes facing north are slightly cooler than those on slopes facing south and generally produce more vegetation.

Time

Time, generally a long time, is required for the formation of soils with distinct horizons. The length of time that parent materials have been in place is commonly reflected in the degree of development of the soil profile.

The soils in Collin County range from young to old. The young soils have had very little profile development, but the older soils have well-expressed soil horizons. Trinity soils are examples of young soils that have had little profile development. Except for a darkening of their surface layer and slight leaching of calcium carbonate, Trinity soils retain most of the characteristics of their calcareous clayey parent material. Wilson soils, which occur on the uplands, are an example of older soils that have well-developed horizons. These soils formed in calcareous clays, but after hundreds of years of leaching and eluviation, a noncalcareous, blocky clay subsoil has developed, and it little resembles the parent material.

Processes of soil horizon differentiation

The differentiation of soil horizons in Collin County is the result of several processes. Among these are (1) accumulation of organic matter, (2) leaching of carbonates and salts, (3) reduction and transfer of iron, and (4) translocation of silicate clay minerals. In most soils more than one of these processes have been active in the development of horizons.

Accumulation of organic matter in the upper part of the soil profile has been important in the formation of an A1 horizon. Generally, the soils of Collin County contain medium to large amounts of organic matter. In eroded areas, the soils normally have a low content of matter.

Much leaching of carbonates and salts has occurred in Wilson and Crockett soils. Some leaching has occurred in Hunt soils, and they do not have free lime in the upper 15 to 20 inches. Most of the soils in Collin County, however, are only slightly leached. Houston Black clay, for example, has a thick A horizon that is high in carbonates. The clay soil was leached slowly, and not enough time has passed for removal of the carbonates.

Reduction and transfer of iron, a process called gleying, is evident in the poorly drained soils of the county. The grayish color in the subsoil horizons indicates the reduction and loss of iron. Some horizons have mottles of yellowish red to brown or strong brown and concretions indicating a segregation of iron. The Crockett soils are examples of somewhat poorly drained, grayish soils that are mottled in the lower horizons.

Translocation of clay minerals has taken place in Crockett and Wilson soils and has contributed to horizon development. The B horizons generally have accumulations of clay (clay films) in the pores and on surfaces of peds. These soils were probably leached of carbonates and soluble salts before translocation of silicate clays took place.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First, through classification, and then through use of soil maps, we can apply our knowledge to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Therefore, readers interested in developments of the system should search the latest literature available (*3*, *5*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. In table 7, the soil series of Collin County are placed in some categories of the current system. Most of the classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Table 7 shows that the five soil orders in Collin County are Entisols, Vertisols, Inceptisols, Mollisols, and Alfisols.

Entisols are recent soils that do not have genetic horizons or that have only the beginning of such horizons. In Collin County Entisols include the soils previously classified as Lithosols.

Vertisols are soils in which natural churning or inversion of soil material takes place, mainly through the swelling and shrinking of clays. Soils in this order were formerly called Grumusols.

TABLE 7.—*Soil series of Collin County classified according to the current system*

Soil series	Current system [1]		
	Family	Subgroup	Order
Altoga	Fine-carbonatic, thermic	Rendollic Ustochrepts	Inceptisols.
Austin	Fine-carbonatic, thermic	Haplustic Rendolls	Mollisols.
Burleson	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Crockett	Fine, montmorillonitic, thermic	Udertic Paleustalfs	Alfisols.
Eddy	Loamy-skeletal, carbonatic, thermic, shallow	Typic Ustorthents	Entisols.
Ellis	Fine, mixed, thermic	Vertic Ustochrepts	Inceptisols.
Engle	Fine-loamy, mixed, thermic	Typic Haplustolls	Mollisols.
Ferris	Fine, montmorillonitic, thermic	Udorthentic Chromusterts	Vertisols.
Frio	Fine, mixed, thermic	Cumulic Haplustolls	Mollisols.
Houston [2]	Very fine, montmorillonitic, thermic	Typic Chromuderts	Vertisols.
Houston Black	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Hunt	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Lamar	Fine-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Lewisville	Fine, mixed, thermic	Typic Haplustolls	Mollisols.
Stephen	Clayey, mixed, thermic, shallow	Typic Rendolls	Mollisols.
Trinity	Fine, montmorillonitic, calcareous, thermic	Vertic Haplaquolls	Mollisols.
Wilson	Fine, montmorillonitic, thermic	Vertic Ochraqualfs	Alfisols.

[1] Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

[2] These soils do not fit revisions made in the current system of classification shortly before this survey was published, and in the revised system, they would be placed in the Heiden series.

Inceptisols are generally on young but not recent land surfaces; hence, their name is derived from the Latin *inceptum*, for beginning. In this county Inceptisols include some of the soils formerly called Lithosols and Regosols.

Mollisols are soils that have high base supply and a dark A horizon that is friable or soft and has a high content of organic matter. In this order are soils that were formerly called Chernozems, Brunizems, and Rendzinas.

Alfisols are soils that have a clay-enriched B horizon that is high in base saturation. In Collin County this order includes soils previously called Planosols and Reddish Prairie soils.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. Soil properties used to separate suborders mainly reflect either the presence or absence of water-logging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Suborders are separated into great groups on basis of uniformity in kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans that interfere with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 7, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and the others, called intergrades, that have properties of the group and also one or more properties of another great group, subgroup, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES: As explained in the section "How This Survey Was Made," the series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and arrangement in the profile. New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program. A proposed new series has tentative status until review of the series concept at State, regional, and national levels in a judgment that the new series should be established. Most of the soil series described in this publication have been established earlier. When the survey was sent to the printer, three of the soil series had tentative status, and only one, the Hunt series, had been made inactive. Tentative series are the Altoga, the Engle, and the Ferris. In the future, part of the soils that have been classified in the Hunt series will be placed in the Burleson series and part in the Houston Black series.

Additional Facts About the County

This section was prepared for those who want general information about Collin County. It discusses briefly the history of the county, climate, flood prevention, and agricultural statistics.

History

In 1846 the Texas Legislature created Collin County from Fannin County and named it after Collin McKinney, a pioneer settler of the area who signed the Texas Declaration of Independence. The county seat was established at Buckner in 1847 but was moved to McKinney about a year later. At that time some of the countryside was in timber.

Climate [5]

The climate of Collin County is warm temperate, subtropical, and humid. Summers are hot. Average annual rainfall is 34.80 inches; average annual temperature, 65.3° F.; and average annual relative humidity, about 63 percent.

Table 8 summarizes data on climate recorded at McKinney in Collin County. These data were based on a 29-year record through 1963.

A wider range between maximum and minimum temperature is characteristic of the climate in Collin County, but the periods of extreme cold occur only occasionally and are short lived. Mild weather occurs frequently. Likewise, the extremely high temperatures that sometimes occur in summer usually do not last long. Sudden changes in temperature and humidity occur in winter when cold, dry, polar air replaces warm tropical air. After passage of a cold front, drops in temperature of 20° or more within an hour are common. The high temperatures of summer are associated with fair skies, southwesterly winds, and dry air.

Rainfall is fairly evenly distributed throughout the year, though usually the maximum occurs in April and May, and the minimum occurs in August. Thus, August is ordinarily the hottest and driest month. A large part of the annual precipitation comes in thundershowers that occasionally are heavy for brief periods. Consequently, a part of the rainfall is usually lost to the soil because runoff is rapid. Snow seldom falls and is an unimportant source of moisture.

The prevailing surface winds are southerly. Strong winds from the north occur frequently during winter, but their duration is fairly short. Average annual sunshine is about 66 percent of the sunshine possible. Mean annual lake evaporation is estimated at 56 inches, two-thirds of which evaporates in the warm season, May through October.

The average length of the freeze-free period is 237 days, but this period varies considerably from year to year. The average number of days between the last occurrence of a 28° temperature in spring and the first occurrence of such

[5] By ROBERT B. ORTON, State climatologist, U.S. Weather Bureau.

TABLE 8.—*Normal monthly and annual temperatures and precipitation at McKinney*
[Elevation, 612 feet]

Month	Temperature			Precipitation		
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1963)	Wettest year (1957)
				Inches	*Inches*	*Inches*
January	44.2	87	−1	2.21	0.46	1.26
February	49.1	85	−5	2.59	.22	2.00
March	55.6	94	7	2.78	2.30	4.34
April	65.0	96	29	3.97	4.23	14.42
May	72.8	100	37	5.28	7.05	12.58
June	80.6	107	51	3.22	.97	2.18
July	84.4	112	59	2.42	1.39	.12
August	85.0	118	54	1.78	[1]	.69
September	77.3	110	39	2.82	2.42	4.15
October	67.8	99	27	2.95	.17	2.72
November	54.7	93	11	2.61	1.89	7.46
December	46.7	89	6	2.17	1.38	1.98
Year	65.3	118	−5	34.80	22.48	53.90

[1] Trace.

temperature in fall is 260 days. The average date of the last occurrence of a 32° temperature in spring is March 23, but on an average of 1 year out of every 5, a freeze occurs after April 5. The average date of the first occurrence of a 32° temperature in fall is November 15, but on an average of 1 year out of every 5, a freeze occurs before November 1. Average dates vary locally within the county because of differences in elevation and slope.

Flood Prevention

Flood prevention work was authorized by Public Law 534, which the Congress passed in 1944. This bill authorizes local landowners, the Soil Conservation Service, the Soil and Water Conservation Districts, and the County Commissioners to work together for flood prevention. This work is coordinated with the plan of the Army Corps of Engineers for flood control of major streams.

The county is divided into seven watersheds so that planning and construction is more convenient. These watersheds are Pilot Grove Creek, Sister Grove Creek, White Rock Creek, Rowlett Creek, Little Elm Creek, Upper East Fork Laterals, and East Fork Trinity River above Lavon Reservoir.

Sixty-three floodwater-retarding dams have been constructed in the county, mainly on Honey, Wilson, Rowlett, and Sister Grove Creeks. About 82 or more have been planned for future construction in the county. When these structures have been completed, much of the area in Frio and Trinity soils now classified as frequently flooded probably will be classified as occasionally flooded.

The prevention of flood damage is the chief purpose for building a floodwater-retarding structure (fig. 21), but many of the lakes created are used for recreation and for watering livestock.

Agriculture

In the following paragraphs statistics significant to the agriculture of the county are discussed. This information is from the 1959 and 1964 Census of Agriculture.

***Figure 21.*—Aerial view of a floodwater-retarding structure in an area of Stephen-Eddy complex, 3 to 5 percent slopes, eroded.**

Crops

Cotton, wheat, and grain sorghum are the most important crops grown in the county. Although cotton is still the main cash crop, a smaller acreage is now planted than in the 1930's.

The acreage in cotton increased from 73,698 acres in 1959 to 79,934 acres in 1964. Cotton sold on the market decreased from 35,774 bales in 1959 to 33,205 bales in 1964.

Wheat, the main small grain, increased from 51,119 acres in 1959 to 79,546 acres in 1964. Most of the wheat is grown for market, but some of the acreage is pastured.

The area in grain sorghum harvested has decreased from 52,925 acres in 1959 to 32,644 acres in 1964. Corn and oats are grown in the county, but acreages are decreasing.

Livestock

Beef cattle are the principal livestock. Most of the beef cattle are raised and sold at local auctions for commercial use. The herds are mostly the cow-calf type, and a basic herd is kept the year around. The number of beef cattle in the county increased from 43,144 in 1959 to 53,688 in 1964.

The number of sheep in the county decreased from 19,278 in 1959 to 8,509 in 1964. Many of the flocks are in the area surrounding Plano. The number of dairy cattle decreased from 5,750 in 1959 to 3,438 in 1964.

As meat-processing plants increased in the county, the hog population was decreasing, since hogs were raised mainly for home use. The number of hogs decreased from 11,808 in 1959 to 3,254 in 1964.

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Glossary

Aggregate. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alkaline soil. Generally, a soil that is alkaline throughout most or all of the part occupied by plant roots. Precisely, any soil having a pH value greater than 7.0; practically, a soil having a pH above 7.3.

Alluvium. Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Chalk. A soft, white or light-gray, unindurated limestone consisting principally of skeletons of *Foraminifera* in a matrix of finely crystalline calcite.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate; clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors, consisting of concentrations of compounds or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.
Friable.—When moist, easily crushes under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, soil crushed under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.
Sticky.—When wet, soil adheres to other material; tends to stretch and pull apart, rather than to pull free from other material.
Hard.—When dry, soil is moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, soil breaks into powder or individual grains under slight pressure.
Cemented.—Soil is hard and brittle; little affected by moistening.

Depth, soil. In this soil survey, the following depth classes are used:

Very shallow.—3 to 8 inches of soil over bedrock or another impervious layer that severely restricts growth of roots.
Shallow.—8 to 20 inches of soil over bedrock or another impervious layer that severely restricts growth of roots.
Moderately deep.—20 to 40 inches of soil over bedrock or another impervious layer that restricts growth of roots.
Deep.—More than 40 inches of soil.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artifically.

Gilgai. Usually a succession of microbasins and microknolls in nearly level areas; similar to hog-wallow land.

Horizon, soil. A layer of soil, approximatelly parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major soil horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.
A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active, and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.
C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Loam. The textural class name for a soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Marl. A mixture of clays and calcium carbonate.

Matrix. The natural material in which a fossil, metal, gem, crystal, or pebble is embedded.

Microrelief. Minor surface configurations of the land.

Mohs' scale. A scale of hardness for minerals in which 1 represents the hardness of talc; 2 of gypsum; 3 of calcite; and on up to 10, of diamond.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, chemical, mineralogical, and biological properties of the various horizons that make up the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: fine, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimen-

sion; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 designates a color with a hue of 10YR, value of 6, and a chroma of 4.

Noncalcareous. As used in this survey, a soil that may or may not be alkaline but that does not contain enough free lime to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Parallelepipeds. A six-sided prism whose faces are parallelograms.

Parent material. The disintegrated and partly weathered soil from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Rubble. Small stones, chips from boulders, broken bricks, and so forth.

Runoff. The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the surface without sinking in is called surface runoff; water that enters the ground before reaching surface streams is called ground-water runoff.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that is 85 percent or more sand and not more than 10 percent clay.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the base of a slip surface on a relatively steep slope; and in swelling clays, where there is marked change in moisture content.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over a period of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeters); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material.

Stratified. Composed of, or arranged in, strata, or layers. The term is confined to geological material. Alluvium is commonly stratified, and its strata inherit characteristics of the parent material. Layers that are the result of the soil-forming processes are called horizons.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below the plow depth.

Substratum. Any layer beneath the solum, either conforming (C or R) or unconforming.

Surface layer. Technically, the A horizon; roughly that part of the profile above the subsoil; includes the plow layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness; the plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts runoff so that the water soaks in the soil or flows slowly to a prepared outlet. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river or lake. Stream terraces are frequently called *second bottoms*, as contrasted to *flood plains*, and are seldom subject to overflow.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. (See also Clay, Sand, and Silt.) The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 1, p. 7, for approximate acreage and proportionate extent of soils; table 2, p. 33, for predicted average acre yields of principal dryfarmed crops; and pp. 36 to 44 for information on engineering uses of soils]

Map symbol	Mapping unit	Page	Capability unit		Pasture and hayland group	
			Symbol	Page	Symbol	Page
AlD2	Altoga silty clay, 5 to 8 percent slopes, eroded.	8	IVe–3	31	E	35
AlE3	Altoga silty clay, 8 to 12 percent slopes, severely eroded.	8	VIe–2	32	I	35
AuB	Austin silty clay, 1 to 3 percent slopes	9	IIe–3	29	D	35
AuC2	Austin silty clay, 3 to 5 percent slopes, eroded.	9	IIIe–5	30	E	35
AuD2	Austin silty clay, 5 to 8 percent slopes, eroded.	10	IVe–3	31	E	35
BcA	Burleson clay, 0 to 1 percent slopes	11	IIs–6	30	A	34
BcB	Burleson clay, 1 to 3 percent slopes	11	IIIe–1	30	A	34
BcB2	Burleson clay, 2 to 4 percent slopes, eroded	11	IVe–5	31	B	34
CrC2	Crockett soils, 2 to 5 percent slopes, eroded	12	IVe–5	31	B	34
CrD2	Crockett soils, 5 to 8 percent slopes, eroded	12	VIe–1	32	B	34
EdB	Eddy gravelly clay loam, 1 to 3 percent slopes.	13	IVs–1	31	H	35
EdD2	Eddy gravelly clay loam, 3 to 8 percent slopes, eroded.	13	VIe–2	32	H	35
ElD2	Ellis clay, 3 to 8 percent slopes, eroded	14	IVe–2	31	H	35
EnB	Engle clay loam, 1 to 3 percent slopes	14	IIe–3	29	D	35
EnC2	Engle clay loam, 3 to 5 percent slopes, eroded.	14	IIIe–5	30	E	35
FeE3	Ferris-Houston clays, 5 to 12 percent slopes, severely eroded.	16	VIe–2	32	I	35
Ff	Frio clay loam, frequently flooded	16	Vw–1	32	J	36
Fo	Frio clay loam, occasionally flooded	17	I–1	29	J	36
HcC2	Houston clay, 3 to 5 percent slopes, eroded	18	IIIe–3	30	C	34
HcD2	Houston clay, 5 to 8 percent slopes, eroded	18	IVe–2	31	C	34
HoA	Houston Black clay, 0 to 1 percent slopes	19	IIs–6	30	C	34
HoB	Houston Black clay, 1 to 3 percent slopes	20	IIe–1	29	C	34
HoB2	Houston Black clay, 2 to 4 percent slopes, eroded.	20	IIIe–3	30	C	34
HuA	Hunt clay, 0 to 1 percent slopes	21	IIs–6	30	C	34
HuB	Hunt clay, 1 to 3 percent slopes	21	IIe–1	29	C	34
LaC2	Lamar clay loam, 3 to 5 percent slopes, eroded.	22	IIIe–5	30	E	35
LaD2	Lamar clay loam, 5 to 8 percent slopes, eroded.	22	IVe–3	31	E	35
LaE3	Lamar clay loam, 5 to 12 percent slopes, severely eroded.	22	VIe–2	32	I	35
LeB	Lewisville silty clay, 1 to 3 percent slopes	23	IIe–3	29	D	35
LeC2	Lewisville silty clay, 3 to 5 percent slopes, eroded.	23	IIIe–5		E	35
ScB	Stephen silty clay, 1 to 3 percent slopes	24	IIIe–6	30	H	35
SeC2	Stephen-Eddy complex, 3 to 5 percent slopes, eroded:	25				
	Stephen soil		IVe–4	31	H	35
	Eddy soil		VIe–2	32	H	35
Tf	Trinity clay, frequently flooded	26	Vw–1	32	F	35
To	Trinity clay, occasionally flooded	26	IIs–1	29	J	36
WcA	Wilson clay loam, 0 to 1 percent slopes	26	IIs–5	29	A	34
WcB	Wilson clay loam, 1 to 3 percent slopes	27	IIIe–1	30	A	34

U.S. GOVERNMENT PRINTING OFFICE: 1969

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

COLLIN COUNTY, TEXAS

1 0 1 2 3 4

N

GRAYSON COUNTY

FANNIN COUNTY

COLLIN COUNTY

DENTON COUNTY

HUNT COUNTY

DALLAS COUNTY

KAUFMAN COUNTY

ROCKWALL COUNTY

33°20′

33°10′

33°00′

96°50′

96°40′

96°30′

96°20′

Gunter
Sadler
Howe
Tioga
Whitesboro
Van Alstyne
Dorchester
Pottsboro
Denison
Sherman
Bells
Collinsville
Tom Bean
Leonard
Ivanhoe
Honey Grove
Ladonia
Savoy
Celina
Weston
Kelly
Anna
Westminster
Desert
Pike
Blue Ridge
Fayburg
Valdasta
Verona
Chambersville
Melissa
Roland
Rhea Mills
Bloomdale
Prosper
Altoga
Climax
New Hope
Milligan
Princeton
Farmersville
Rock Hill
MC KINNEY
Bigkers
Culleoka
Frisco
Fairview
Wetsel
Forest Grove
Allen
Lebanon
Lolaville
Lucas
Branch
Copeville
Josephine
Nevada
Lavon
Shepton
Plano
Murphy
Wylie
Renner
Royse City

LAVON RESERVOIR
LAVON DAM
Mc Kinney Club Lake
South Lake
North Lake

SOIL ASSOCIATIONS

1 Houston Black–Austin association: Gently sloping to sloping, clayey soils that are deep over marl and chalk; on uplands

2 Houston Black–Houston association: Gently sloping to sloping, clayey soils that are deep over compact clays; on uplands

3 Trinity–Frio association: Deep, nearly level, clayey and loamy soils on flood plains

4 Houston Black–Burleson association: Nearly level to gently sloping, deep, clayey soils on stream terraces

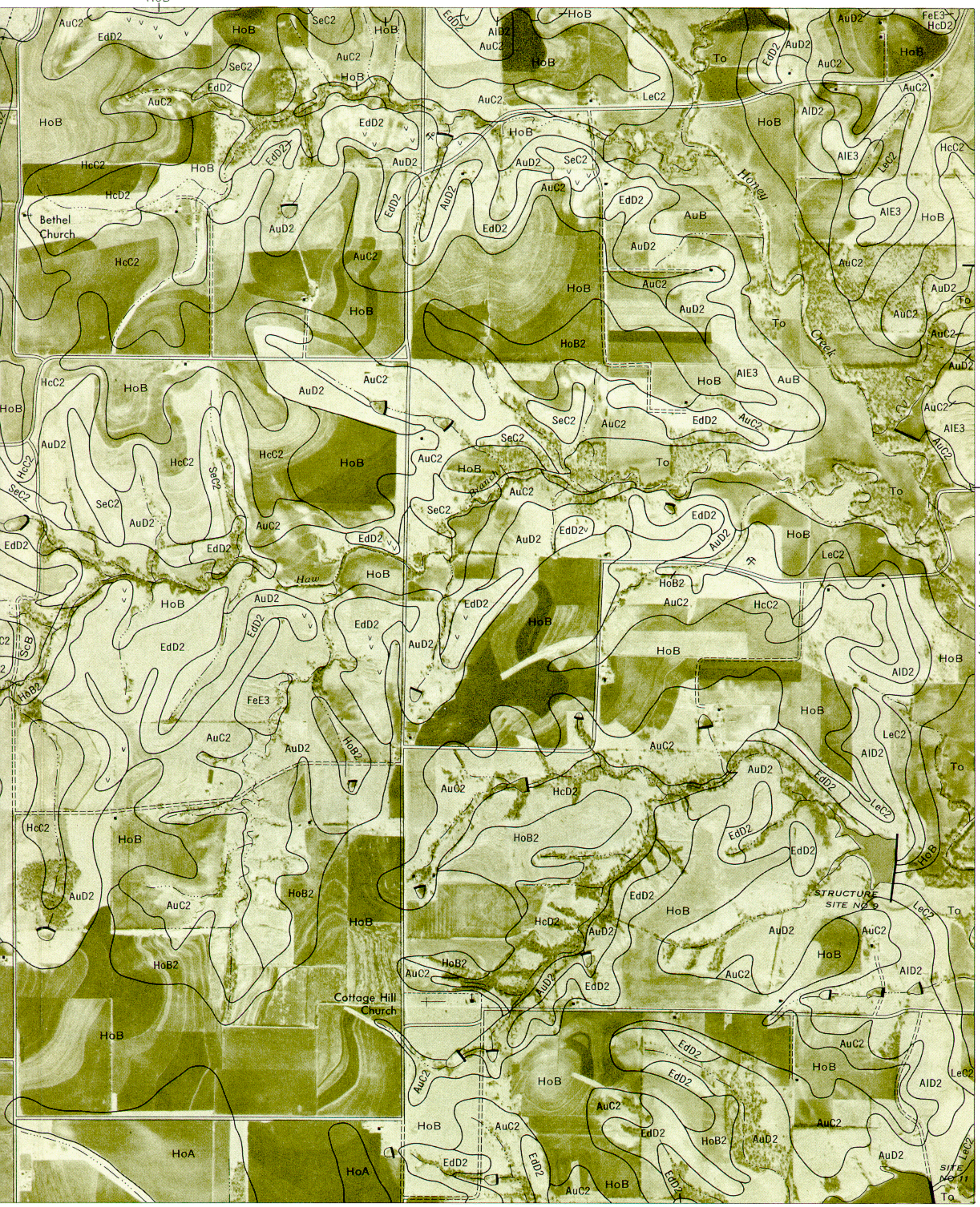
5 Ferris–Houston association: Sloping to strongly sloping, eroded, deep, clayey soils on uplands

6 Wilson–Burleson association: Nearly level to gently sloping, deep, loamy and clayey soils on uplands

July 1968

INDEX TO MAP SHEETS
COLLIN COUNTY, TEXAS

N
(Joins sheet 4)
(Joins sheet 9)
(Joins sheet 17)
Bethel Church
CORINTH CEMETERY
Creek
0
½
1 Mile

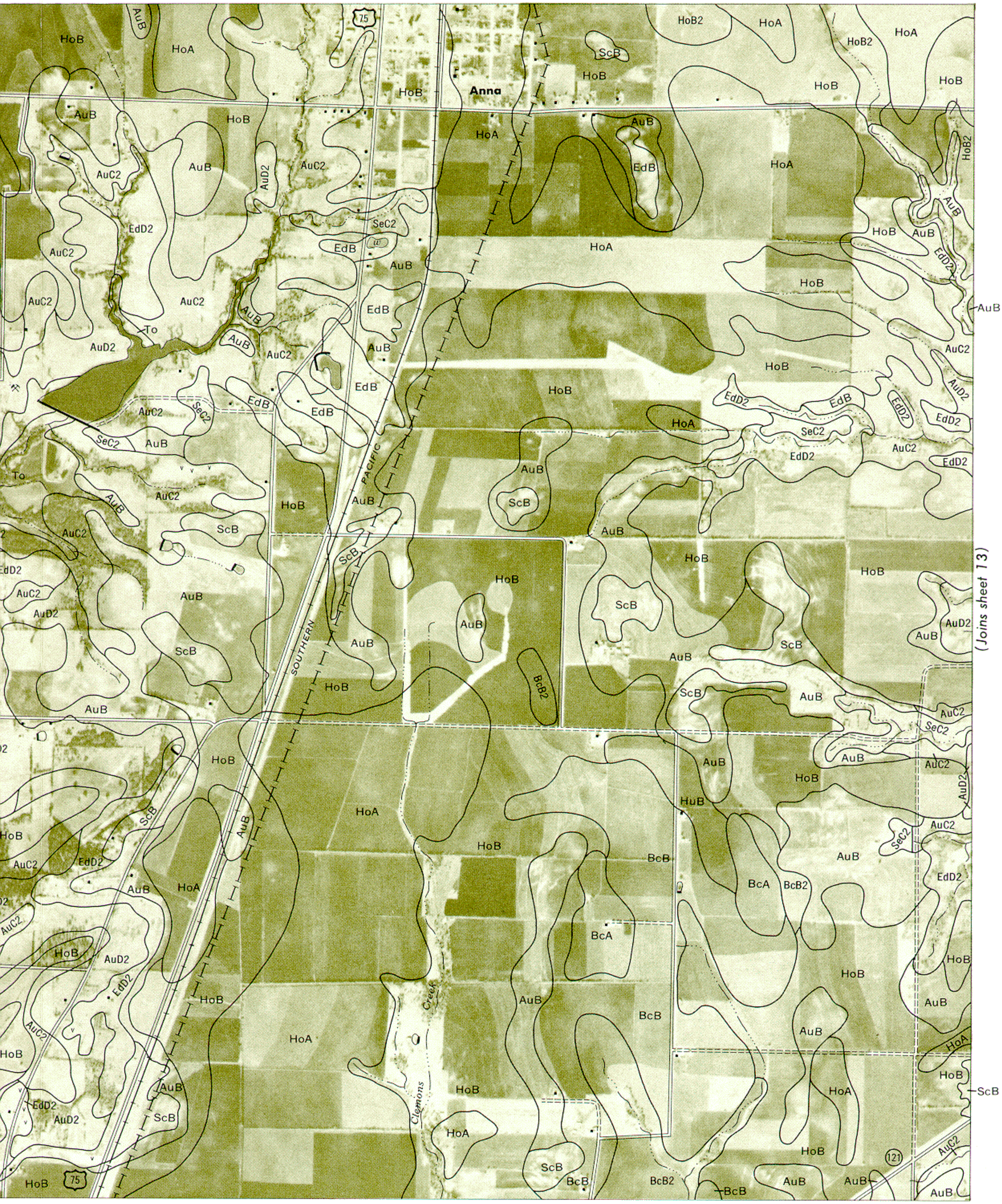

Bethel Church
Cottage Hill Church
Haw Branch
Honey Creek
STRUCTURE SITE NO 9
SITE NO 11
(Joins sheet 11)
0
5 000 Feet

(Joins sheet 10)

(Joins sheet 5)
N
HoB
AlD2
AlE3
LeC2
AuC2
To
HoB
AlE3
AuD2
w
LeC2
AuC2
HoB2
AlD2
AuD2
AuC2
Fo
AuD2
AuD2
AlD2
HoB
HoA
HoB
EdD2
AuC2
Fo
AlE3
AuD2
AuB
HoB
AlD2
AlD2
To
LeB
LeC2
HuB
AlD2
HoB2
HoB
AuC2
AlD2
Creek
CABLE
LeC2
w
AlD2
AuC2
AuC2
AlD2
AlE3
To
Hurricane
HoB
UNDERGROUND
East
HcC2
Fo
HoB
AlD2
FeE3
AlD2
AuD2
HoB
AlD2
LeC2
AuD2
EdD2
To
LeB
AlD2
AlD2
AuC2
LeC2
HoB
AlD2
LeC2
EdD2
Fork
EdD2
HoB
AuB
AlE3
HoB
To
AuC2
AuC2
AlD2
Trinity
AuD2
AlD2
AuC2
HoB
EdD2
HoB
AlE3
AuC2
HoB
HoA
HcC2
AuD2
AlD2
HoB
HoB
HoA
River
To
HoB
HoB2
HoB
To
LeB
HoB
LeB
AlE3
AuC2
AlD2
AuD2
To
Tf
AlE3
HoB2
HoB
LeB
Chambersville
HoB2
EdD2
AlD2
LeC2
HoA
AuB
HoB2
AuC2
HoB
HoA
HoB2
LeC2
LeB
AuB
HoB
HoA
(Joins sheet 12)
(Joins sheet 18)
0
5 000 Feet

12

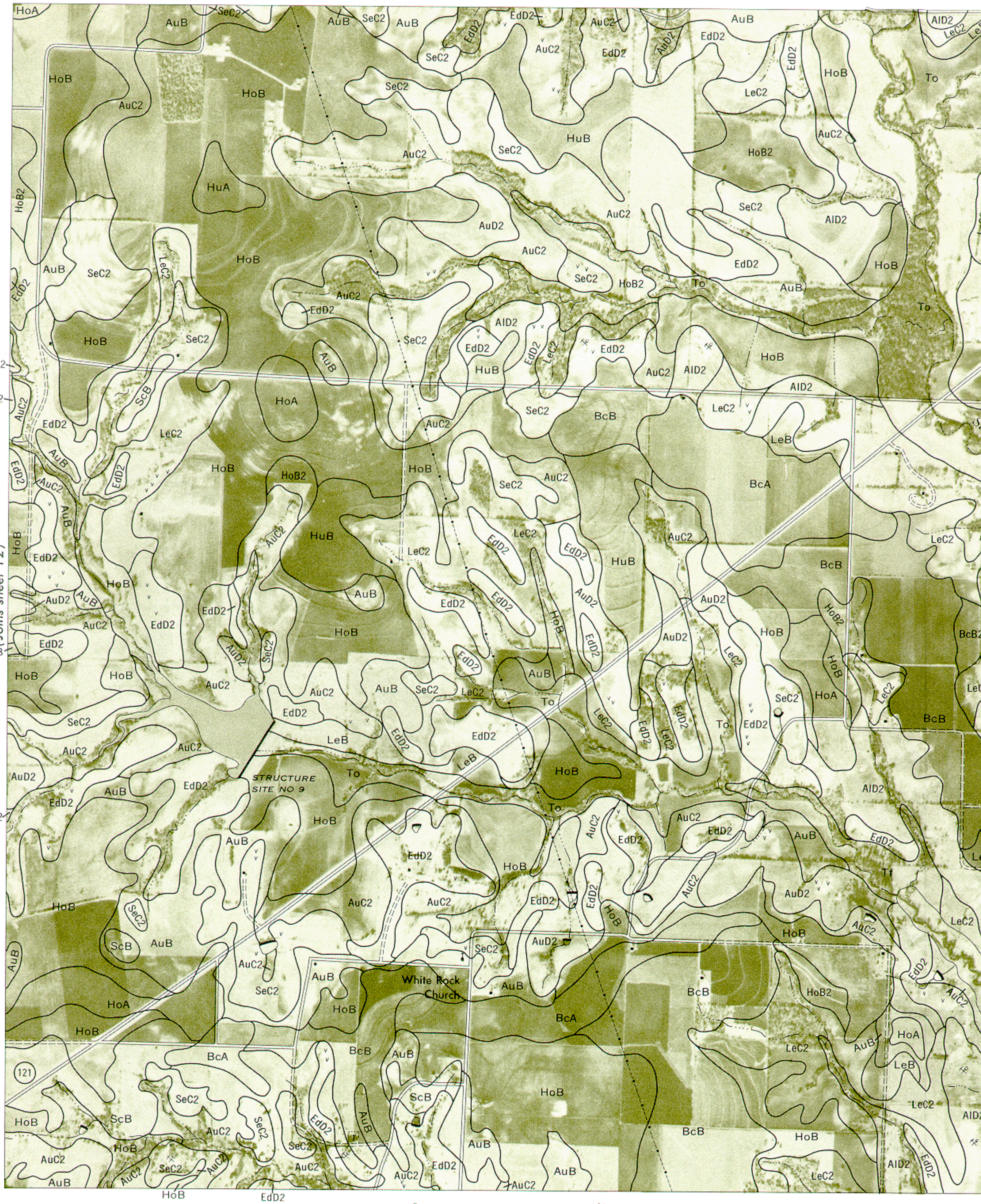
(Joins sheet 6)
N
(Joins sheet 11)
(Joins sheet 19)
STRUCTURE SITE NO 47
Throckmorton Creek
Slayter Creek
Melissa
0
½
1 Mile



(Joins sheet 13)

ile

0 5 000 Feet


HoA
AuB
SeC2
HoB
AuC2
HoB2
HuA
HuB
AuD2
EdD2
LeC2
ScB
AID2
To
BcB
BcA
LeB
Tf
HoA
White Rock Church
121
STRUCTURE SITE NO 9
(Joins sheet 12)
0
½
1 Mile

(Joins sheet 7)

13

N

121

AID2 LeC2 LeB LeC2 HoB AID2 AID2 EdD2 SeC2 AuB AuC2 HoB ScB HoB HoB HoA HoB2 HoB2 AuD2 AuC2 ScB ScB ScB HoB AuB SeC2 HoB AuD2 ScB HuB ScB AuC2 EdD2 SeC2 HoB AuB AuC2 EdD2 AuD2 AuC2 HoB2 EdB SeC2 HoB2 AuC2 EdD2 EdD2 AuD2 HcD2 HcC2 EdD2 HoB HcC2 HcC2 EdD2 HcC2 EdD2 HcD2 FeE3 HoB2 EdD2 FeE3 HcC2 FeE3 SeC2 HcD2 HcC2 HoB2 FeE3 HcC2 HoA HoB

To HoB AIE3 HuB HoA HoB AID2 LeC2 AIE3 BcB HoB HuB LeC2 HoA ScB HoB AID2 BcB HoB To HoB HoB

Sister Grove Creek

To LeC2 AID2 LeC2 To BcB LeC2 HoB To LeC2 AID2 LeC2 To AID2 AuC2 HuB BcA HuB BcB HcC2 HoB AID2 HuA HoB AID2 HoB2 FeE3 HoB

BcB2 LeC2 LeC2 BcB AID2 HoB AID2 EdD2 LeB Tf AuC2 LeC2 LeC2 HoB2 AID2 To EdD2 AuC2 AuB HoA LeB LeC2 AID2 HoB AID2 EdD2 Fo HoB AID2 AID2 HuB

0 5 000 Feet

(Joins sheet 14)

(Joins sheet 20)

14

N

EID2 (Joins sheet 8)

(Joins sheet 13)

(Joins sheet 21)

0 ½ 1 Mile

Creek
Grove
Pilot
Red
Oak
Blue Ridge
BLUE RIDGE CEMETERY

FANNIN COUNTY

BLUE RIDGE CEMETERY

Desert Creek

Pot Rack

(Joins sheet 15)

0 5 000 Feet

(Joins sheet 14)

(Joins sheet 22)

0 ½ 1 Mile

(Joins inset A, sheet 2)

15

N

HUNT COUNTY

Pike

Creek

Bear Creek

0 5 000 Feet

N
DENTON COUNTY
INDEFINITE BOUNDARY
HoA
HoB
BcB2
LeB
BcA
BcB
HoB2
HcC2
HcD2
Tf
FeE3
EID2
Doe Branch
0
½
1 Mile

(Joins sheet 9)

(Joins sheet 17)

(Joins sheet 23)

Mile   0   5 000 Feet

(Joins sheet 16)

0 ½ 1 Mile

(Joins sheet 10)

To

17

N

HoA HoB HoB2 AuB AuC2 AuD2 EdD2 SeC2 LeC2 AlD2 ScB HcC2 SITE NO 11 Stover Creek

(Joins sheet 18)

(Joins sheet 24)

0 5 000 Feet

(Joins sheet 11)

N

STRUCTURE SITE NO 14

STRUCTURE SITE NO 13

STRUCTURE SITE NO 15

STRUCTURE SITE NO 16

UNDERGROUND

Honey Creek

Roland

(Joins sheet 17)

(Joins sheet 25)

0 ½ 1 Mile

Y, TEXAS — SHEET NUMBER 18

(Joins sheet 18)

0 ½ 1 Mile

(Joins sheet 12)

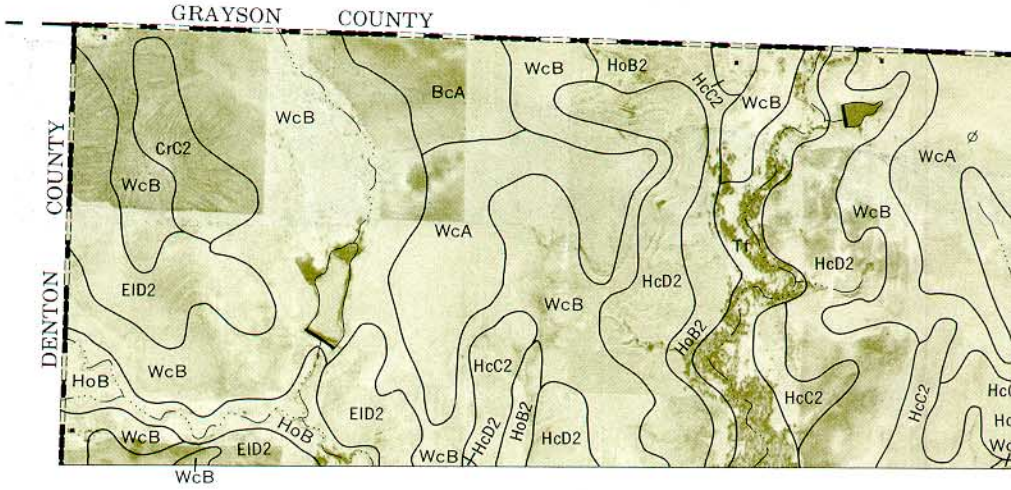
N

(Joins sheet 20)

(Joins sheet 26)

0 5 000 Feet

INSET A



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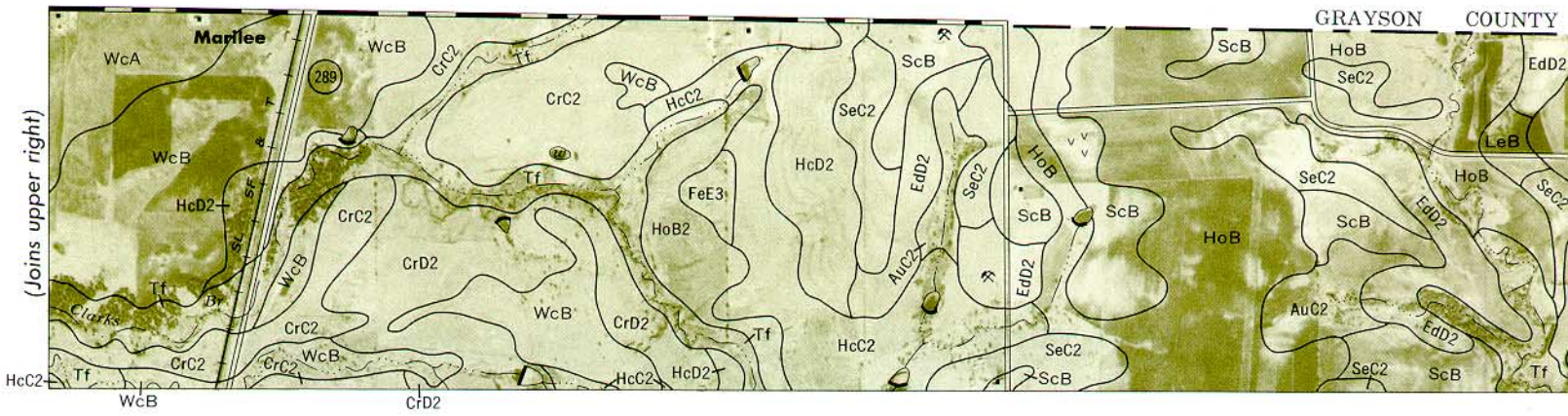
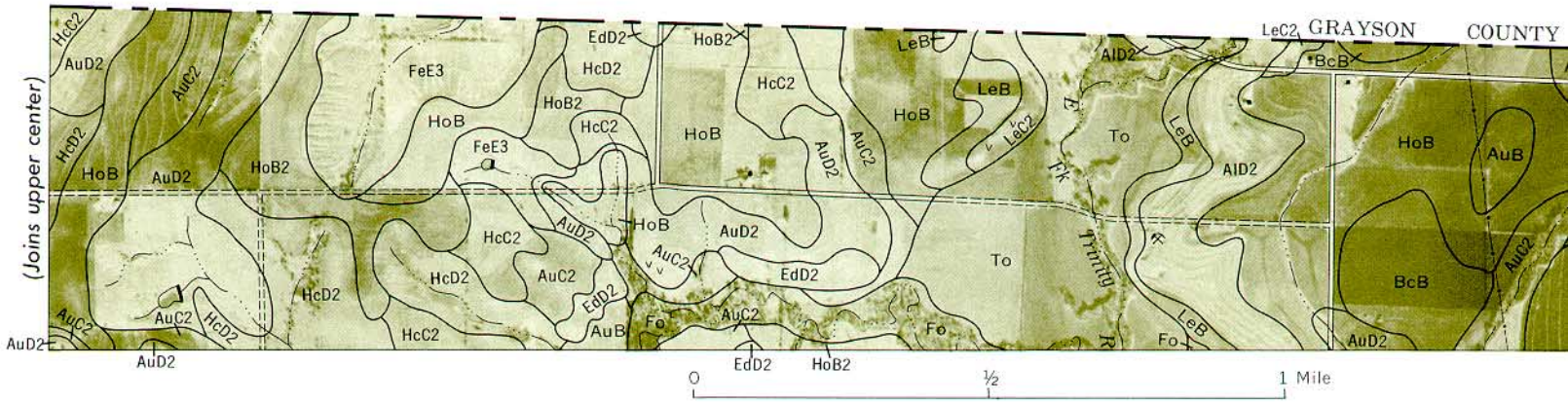
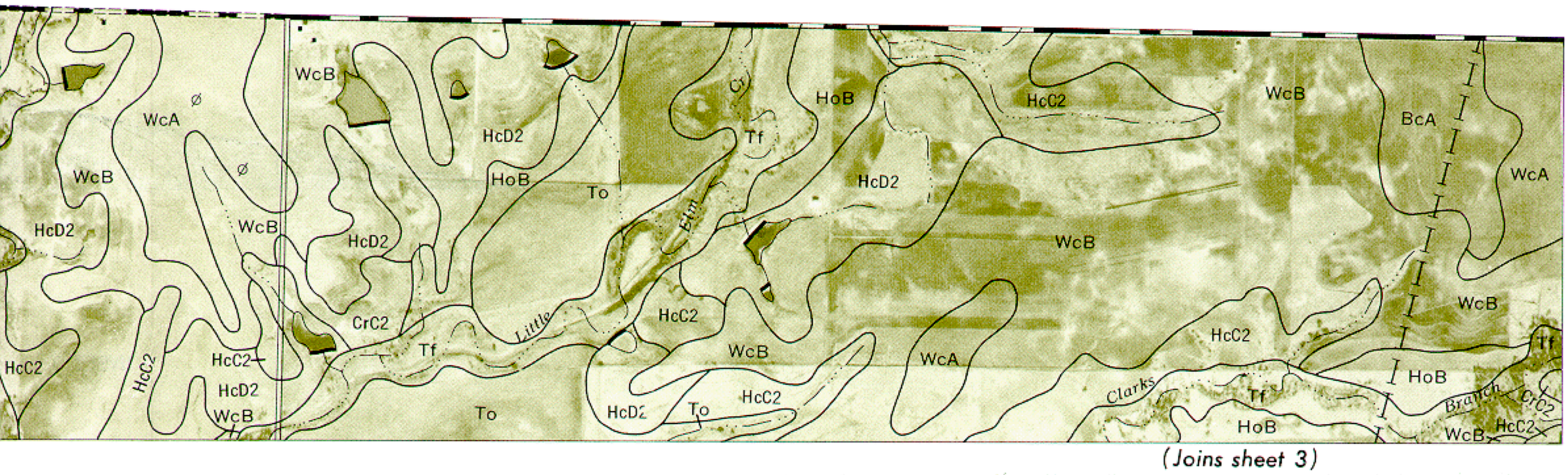




1

N

INSET A



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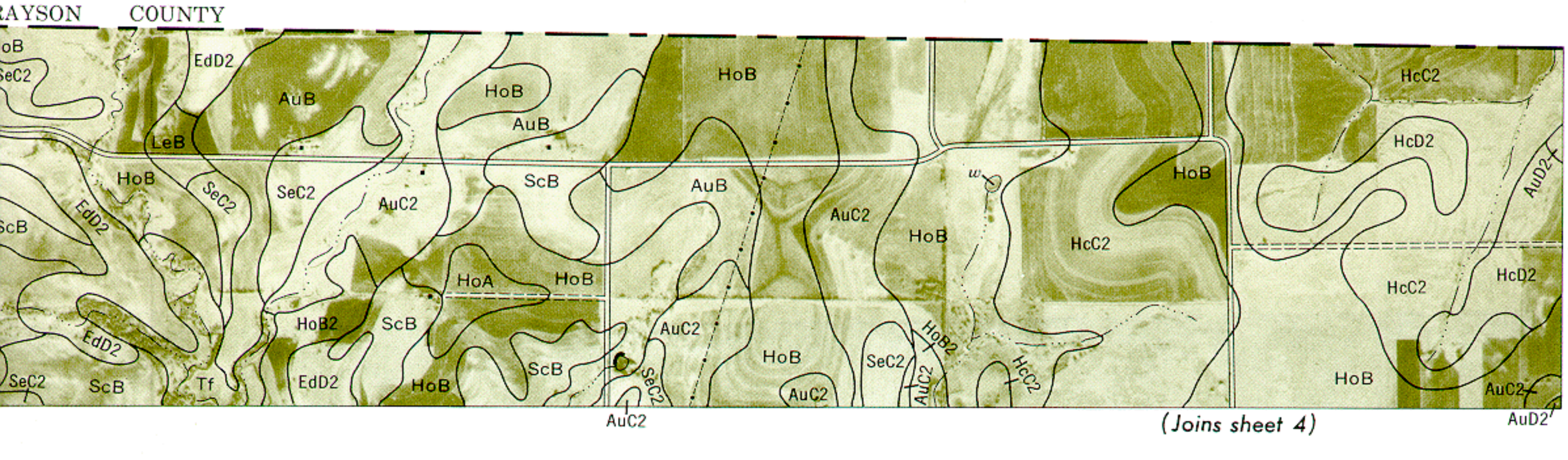
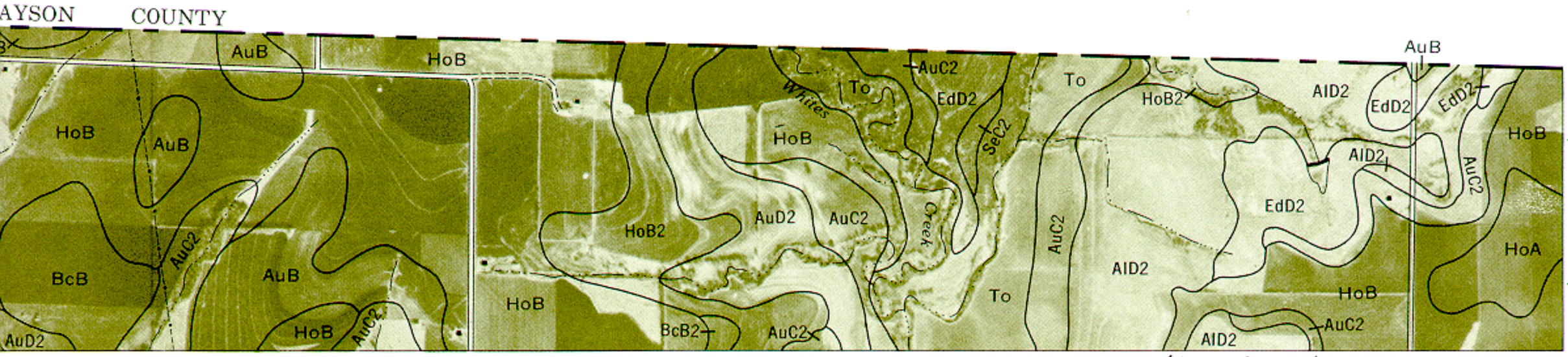
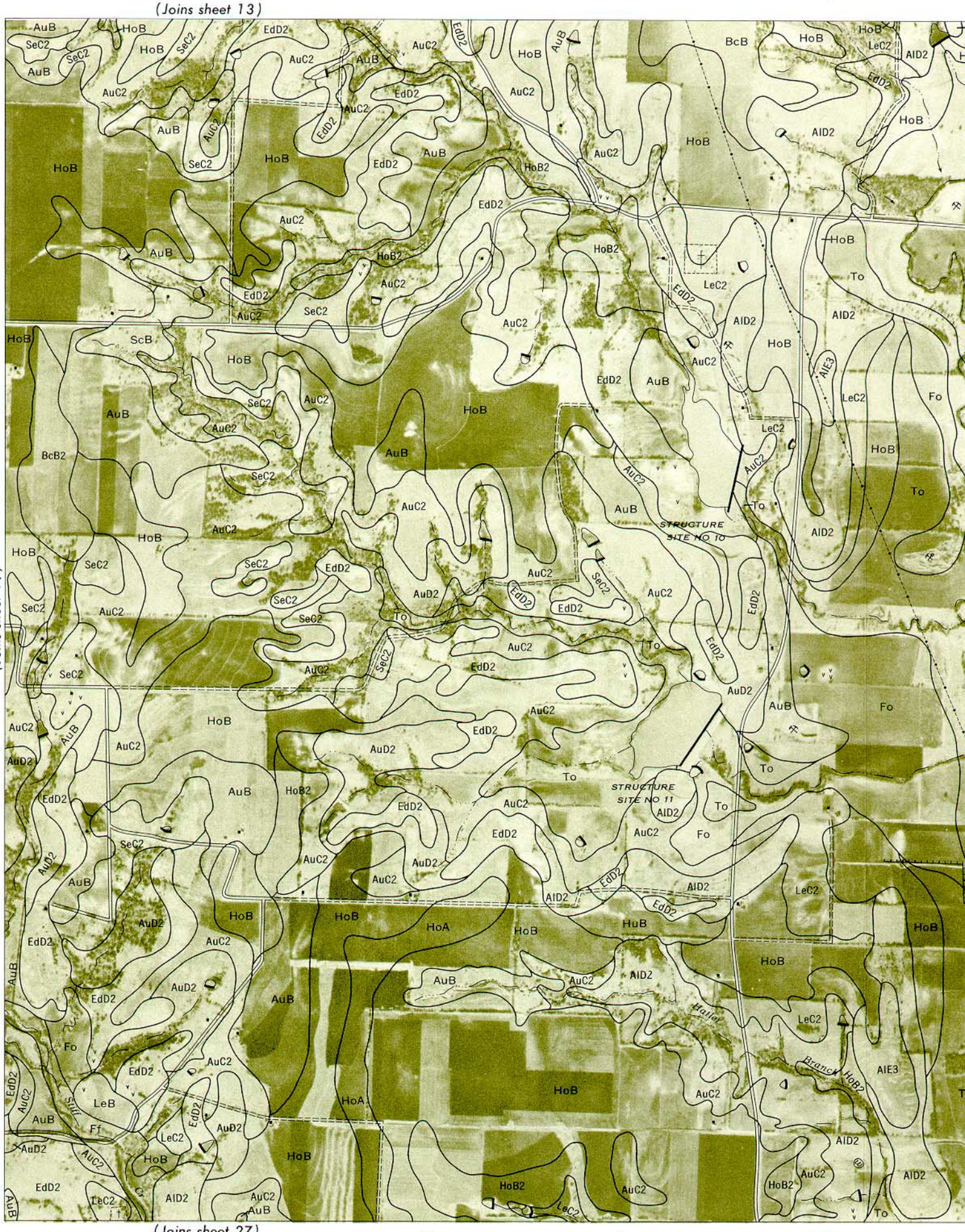




0 5 000 Feet


(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 27)
N
STRUCTURE SITE NO 10
STRUCTURE SITE NO 11
Hallet
Branch
Stiff
0
½
1 Mile

(Joins sheet 21)

Mile

0 5 000 Feet

(Joins sheet 20)

(Joins sheet 14)

21

N

Fayburg

Desert Creek

Rack Creek

Pot Rack Creek

(Joins sheet 22)

(Joins sheet 28)

0 5 000 Feet

(Joins sheet 15)
(Joins sheet 21)
(Joins sheet 29)
N
0
½
1 Mile
Arnold
Creek
Bear Creek
Indian Creek
Old Arnold
HcC2
HoB
WcB
HcD2
BcB
CrC2
To
FeE3
BcB2
HuB
AlD2
WcA
BcA
HoA
HoB2
CrD2
AlE3
LeC2
Tf
Ff

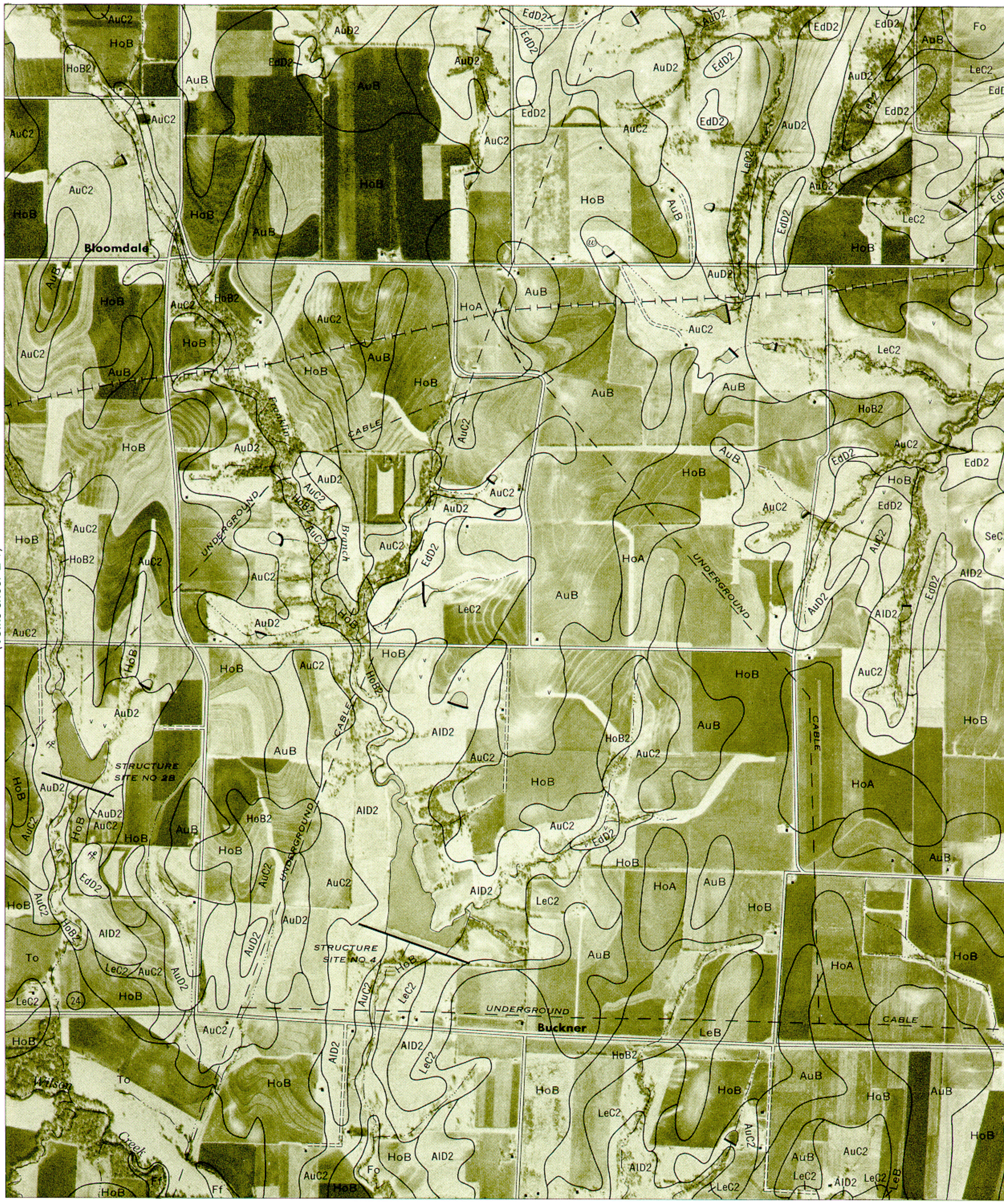
HcD2
WcB
HcC2
BcA
FeE3
HoB
Tf
To
CrC2
HoB2
WcA
BcB
Ff
Lee Creek
Arnold
HUNT COUNTY
Red Oak Creek
0
5 000 Feet

HoA
BcA
HoB
BcB
HoB2
HcC2
HcD2
FeE3
LeB
LeC2
To
Parvin
Branch
Button
DENTON COUNTY
INDEFINITE BOUNDARY
ST LOUIS
SAN FRANCISCO
24
0
½
1 Mile

HcC2 (Joins sheet 16)
23
N
HcD2
AuD2
ScB
HoB
SeC2
HoA
289
EdD2
AuC2
AuB
TEXAS
HcC2
HoB
HcD2
AuC2
HoB
ScB
EdB
SeC2
AuD2
HcD2
EdD2
AuB
HoB
AuC2
HoB
SeC2
AuD2
AuC2
HoA
HoB
SAN FRANCISCO
AuB
AuC2
SeC2
HcC2
AuC2
SeC2
ScB
HoB
ScB
ScB
HoB2
BcB2
Prosper
AuD2
AuB
HcD2
AuC2
SeC2
EdD2
ScB
AuB
EdB
AuB
HoA
HoB
ST LOUIS
AuD2
EdB
SeC2
AuC2
HoB
AuC2
HcC2
ScB
EdB
AuC2
EdB
HcD2
AuC2
AuC2
AuB
LeB
SeC2
HoB
AuD2
SeC2
HoB
HoA
BcB
ScB
EdB
24
BcB
HcC2
AuC2
EdD2
HoB
To
AuC2
SeC2
AuC2
HoB
HoB
HoB
AuC2
SeC2
EdB
HoB
HoB2
HcC2
EdD2
AuB
HoA
289
AuD2
HoB
SeC2
AuC2
AuB
EdB
AuD2
ScB
EdB
(Joins sheet 24)
(Joins sheet 30)
0
5 000 Feet

24
(Joins sheet 17)
N
(Joins sheet 23)
(Joins sheet 31)
Gentle Cr.
Wilson Creek
Walnut Grove Church
WARE CEMETERY
0
½
1 Mile

STRUCTURE SITE NO 2A
STRUCTURE SITE NO 1A
Stover Creek
Wilson Creek
CABLE
UNDERGROUND
(Joins sheet 25)
0
5 000 Feet



(Joins sheet 24)

(Joins sheet 18)

25

N

Trinity R

East Fork

Honey Creek

UNDER CONSTRUCTION

CABLE

US HIGHWAY 75

McKINNEY
county seat

(Joins sheet 26)

(Joins sheet 32)

0 5 000 Feet

(Joins sheet 19)

N

(Joins sheet 25)

(Joins sheet 33)

0 ½ 1 Mile

AuB
EdD2
AuC2
Fo
ScB
BcB2
SeC2
HoB
HoA
HuB
HuA
AuD2
EdB
HoB2
BcA
Dunn Memorial Church
Ticky Creek
Big Branch
New Hope
LeC2
(Joins sheet 27)
0
5 000 Feet

(Joins sheet 26)

0 ½ 1 Mile

(Joins sheet 20)

27

N

(Joins sheet 28)

(Joins sheet 34)

0 5 000 Feet

N

(Joins sheet 21)

(Joins sheet 27)

(Joins sheet 35)

Verona

Verona Church

Branch

Lick

Harrington Branch

Pilot Grove Creek

0 ½ 1 Mile

(Joins sheet 29)

ile

0 5 000 Feet

(Joins sheet 22)

(Joins sheet 28)

(Joins sheet 36)

0 ½ 1 Mile

N

COUNTY

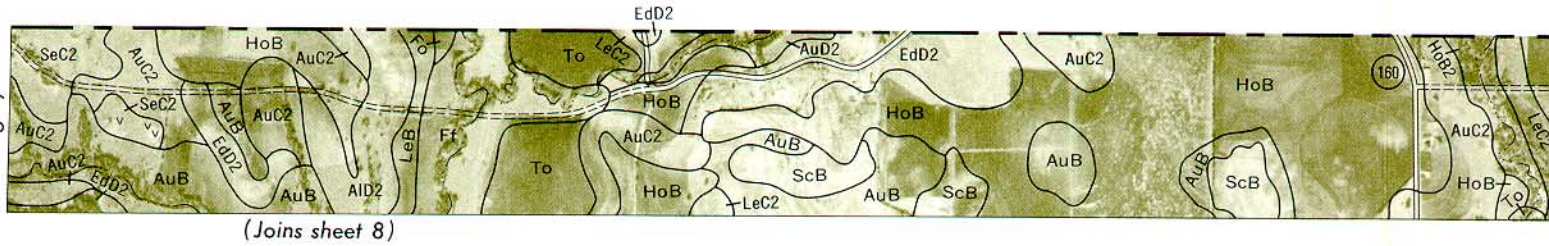
HUNT

0 5 000 Feet

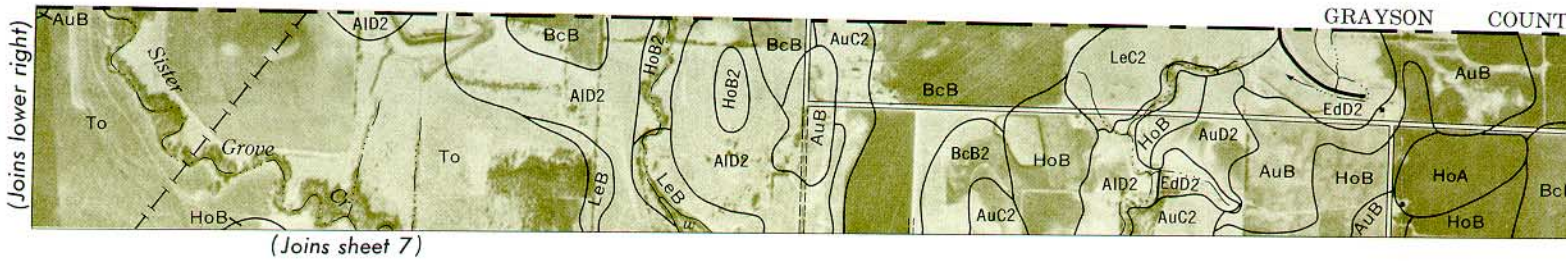
2

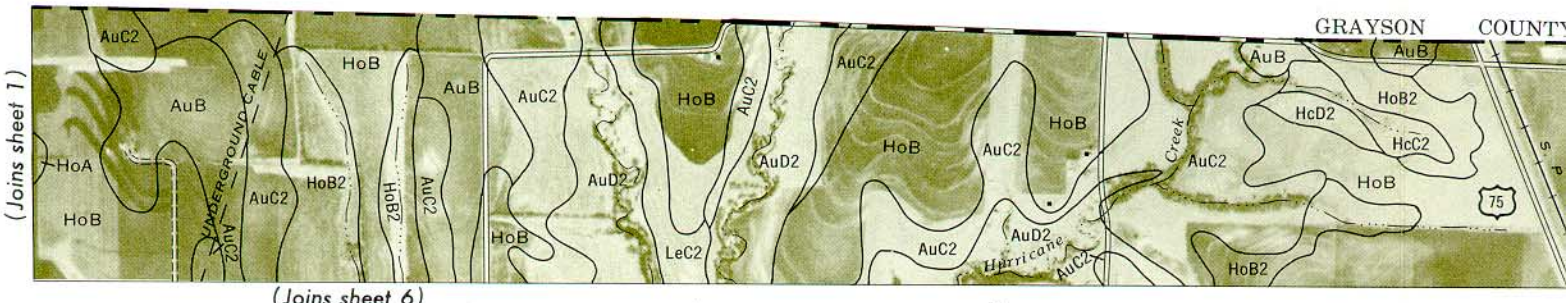
N

INSET B



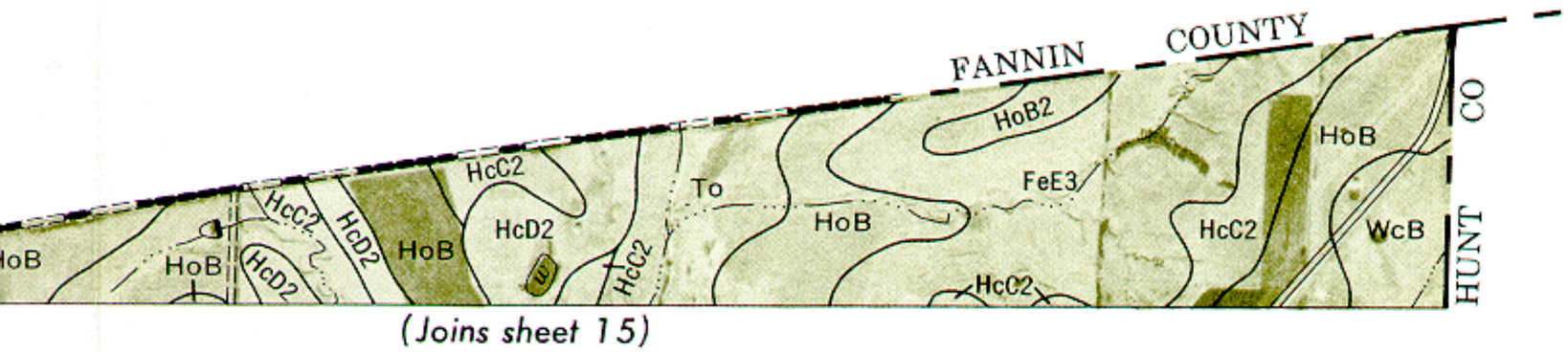
INSET C





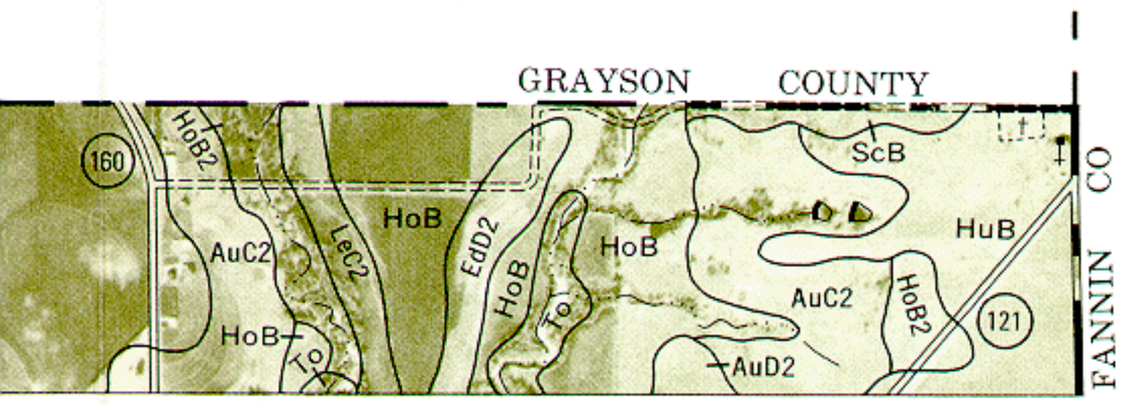
0 ½ 1 Mile

INSET A



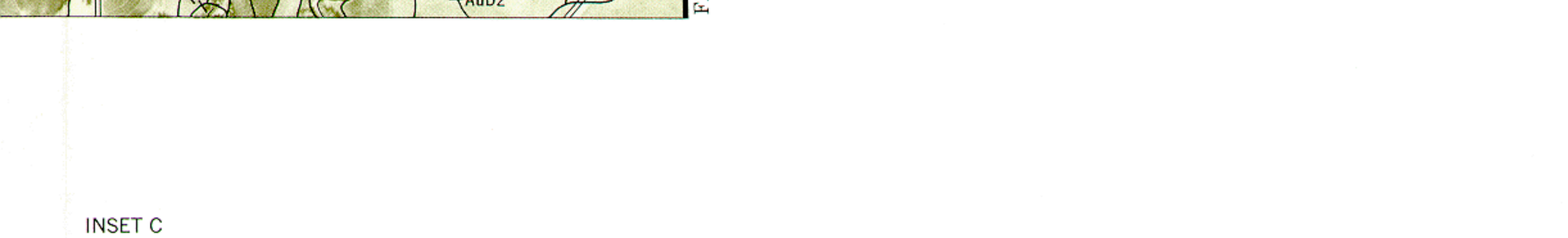
(Joins sheet 15)

INSET B



INSET C

(Joins upper left)



(Joins center left)

le 0 5 000 Feet

N

LeC2
FeE3
HoA
HoB
HcC2
HoB2
HcD2
HcD2
Parvin
To
Br
Tf
Panther
Creek
Power
Plant
TEXAS
AND
SAN FRANCISCO
ST LOUIS
BcB
FeE3
SeC2
AuD2
AuC2
AuB
EdB
EdD2
ScB
DENTON COUNTY
BOUNDARY
INDEFINITE

0 ½ 1 Mile

(Joins sheet 23)

Rock Hill

Rockhill School

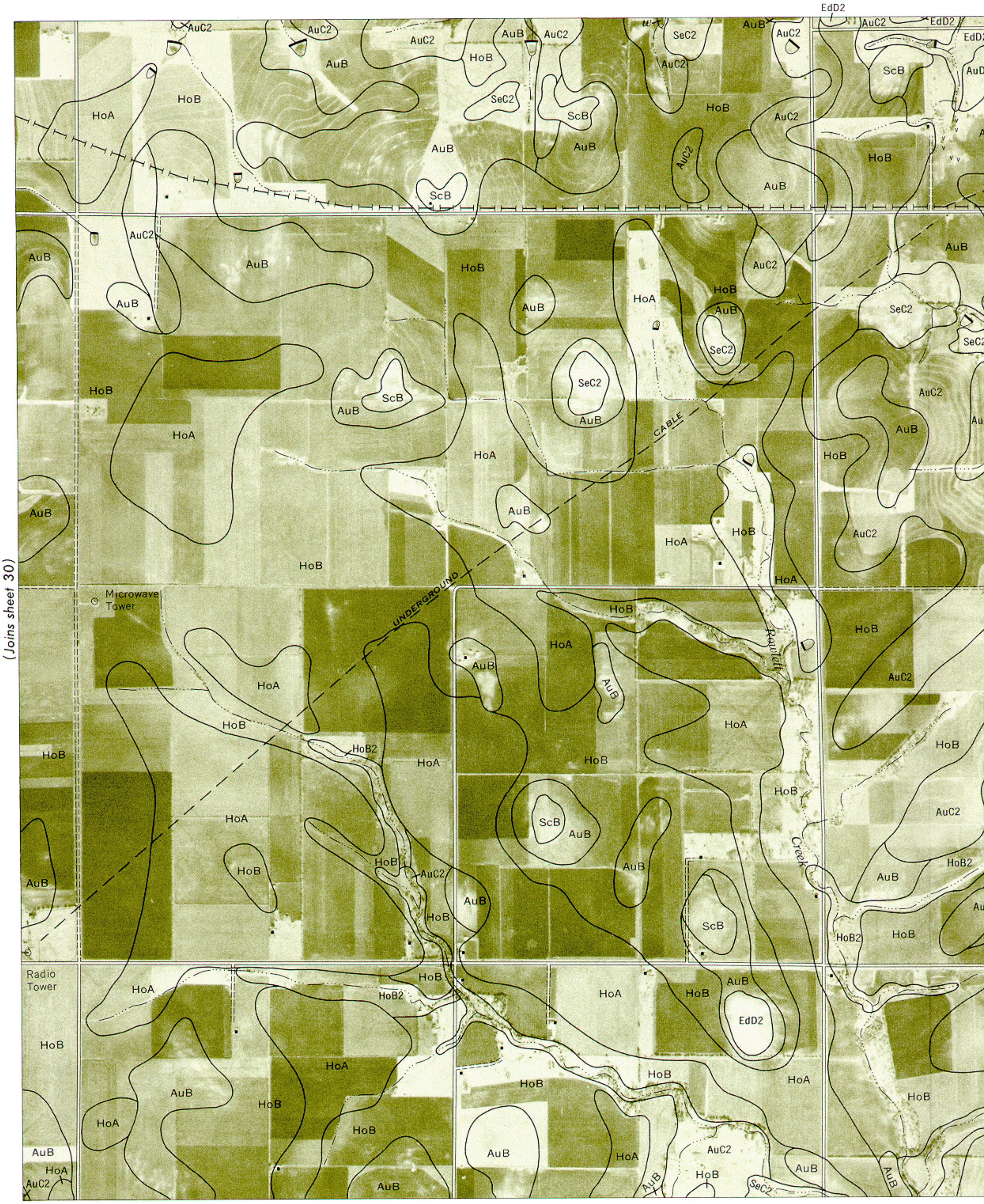
289

HoA HoB HoB2 HcC2 HcD2 FeE3 SeC2 ScB EdB AuC2 AuD2 EdD2 AuB

(Joins sheet 31)

(Joins sheet 37)

0 5 000 Feet



(Joins sheet 30)

0 ½ 1 Mile

(Joins sheet 24)

N

Foot

STRUCTURE SITE NO 3A

STRUCTURE SITE NO 3B

Flying M Ranch Airfield

CABLE

UNDERGROUND

(Joins sheet 32)

(Joins sheet 38)

0 5 000 Feet

(Joins sheet 25)

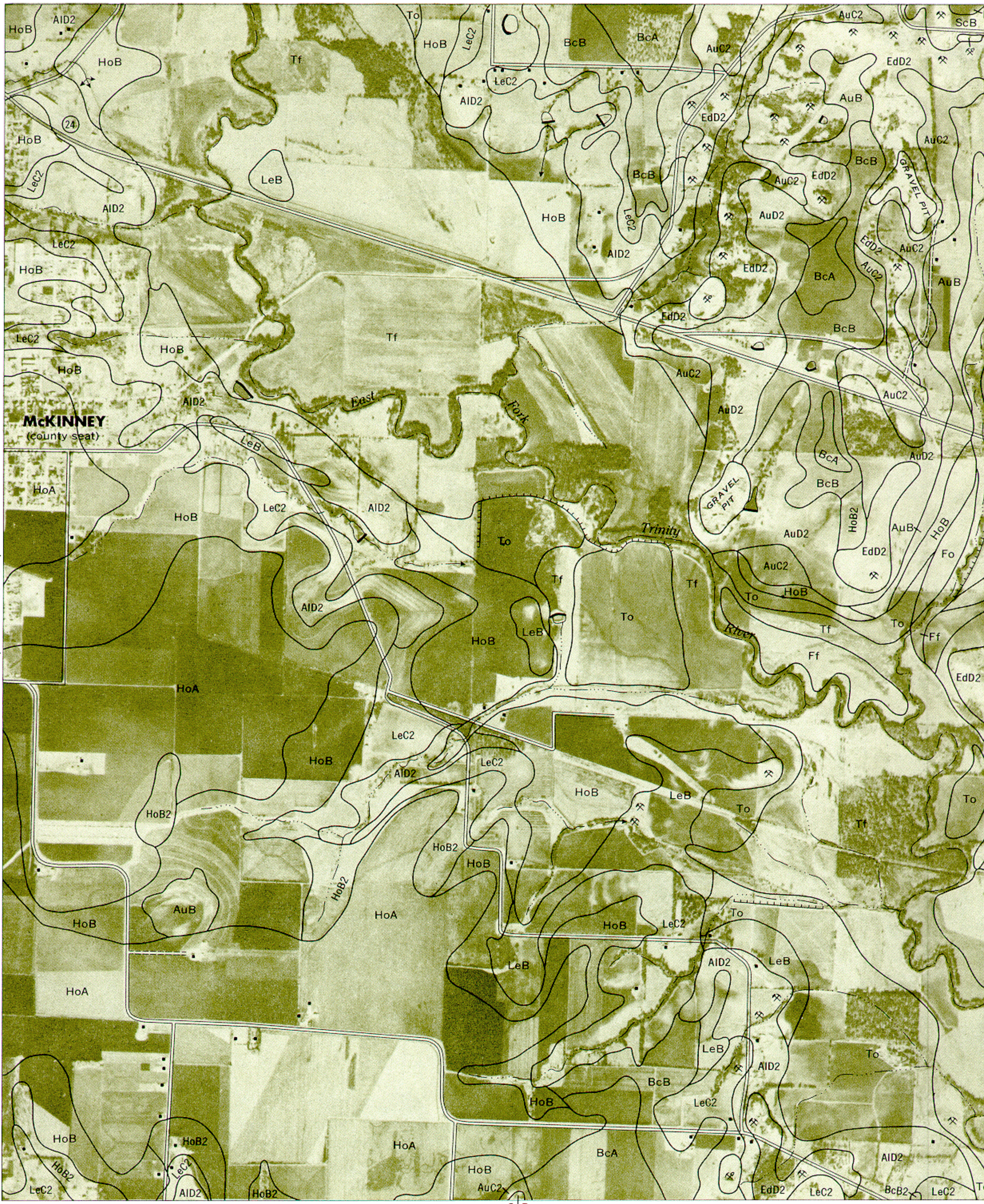
N

(Joins sheet 31)

(Joins sheet 39)

0 ½ 1 Mile

(Joins sheet 33)


McKINNEY
(county seat)
East Fork
Trinity River
GRAVEL PIT
GRAVEL PIT
24
HoB
AID2
LeC2
LeB
Tf
To
BcB
BcA
AuC2
EdD2
AuB
AuD2
ScB
HoA
HoB2
Ff
Fo
(Joins sheet 32)
0
½
1 Mile

(Joins sheet 26)

33

N

Milligan

Big Branch

GRAVEL PIT

(Joins sheet 34)

(Joins sheet 40)

0 5 000 Feet

(Joins sheet 27)

N

(Joins sheet 33)

(Joins sheet 41)

Princeton

Gas Substation

Tf

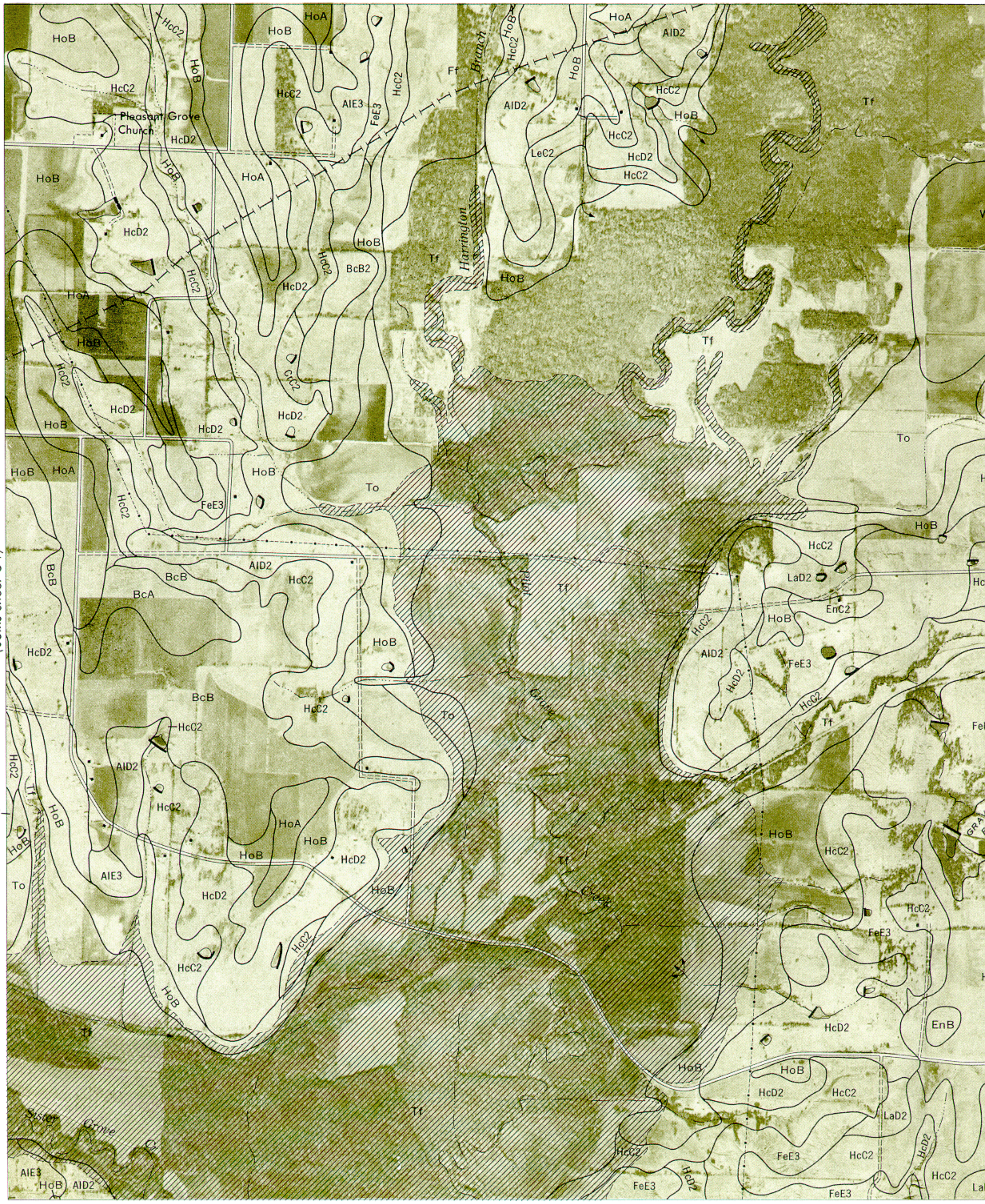
Ticky Creek

To

0 ½ 1 Mile

(Joins sheet 35)

0 5 000 Feet


Pleasant Grove Church
Ff
Branch
Harrington
Pilot
Grove
Creek
Sister
Grove
Cr
HoB
HoA
HcC2
HcD2
AIE3
FeE3
AID2
LeC2
Tf
To
BcB
BcA
BcB2
LaD2
EnC2
EnB
(Joins sheet 34)
0
½
1 Mile

(Joins sheet 28)

35

N

Groves Creek

Henslee Church

Lee Creek

GRAVEL PIT

CEMETERY

FARMERSVILLE

78

(Joins sheet 36)

(Joins sheet 42)

0 5 000 Feet

(Joins sheet 29)

N

(Joins sheet 35)

(Joins sheet 43)

FARMERSVILLE

SANTA FE

TOPEKA AND ATCHISON

Creek

Grove

0 ½ 1 Mile

Mile

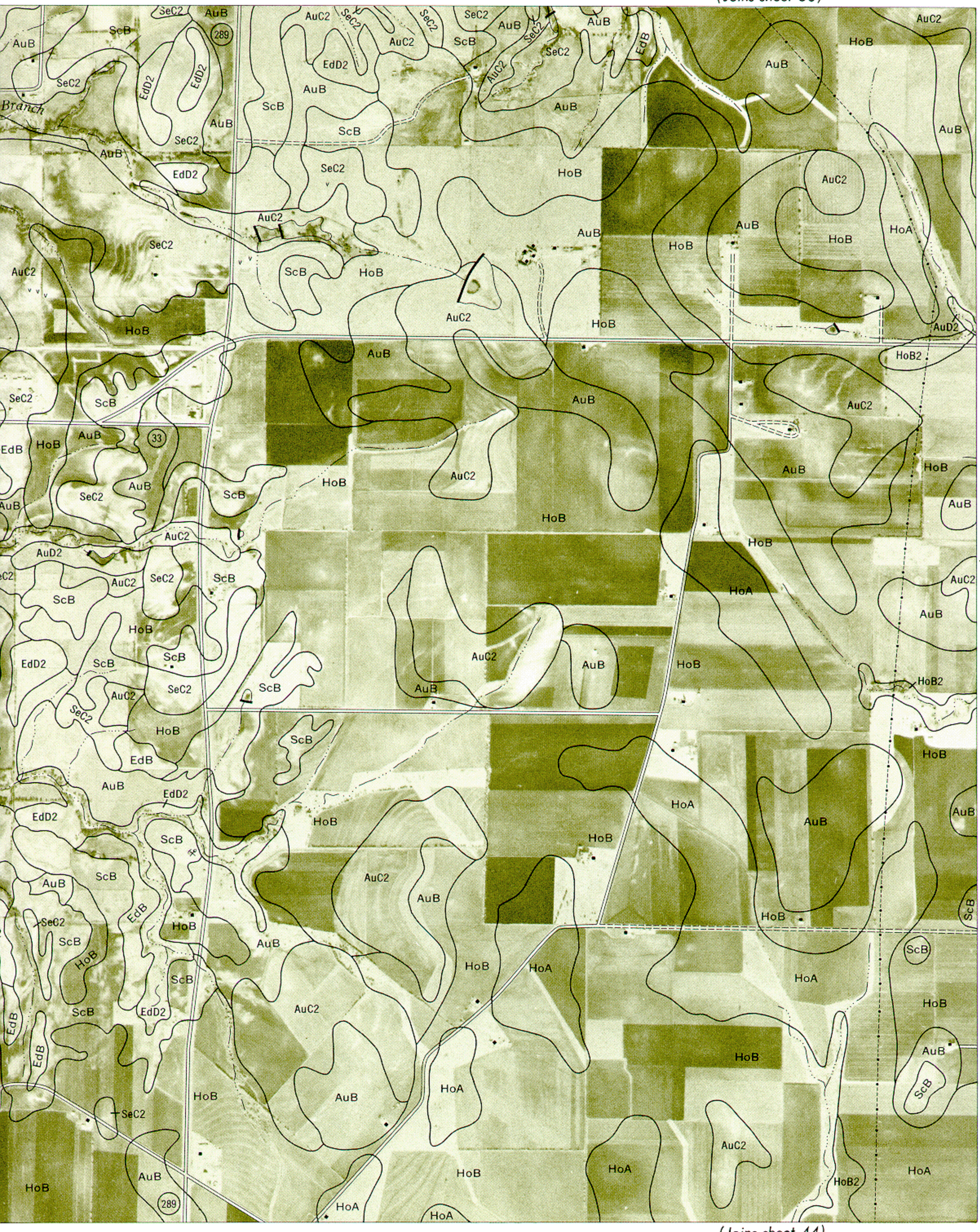
0 5 000 Feet

INDEFINITE BOUNDARY
DENTON COUNTY
SAN FRANCISCO AND TEXAS
ST LOUIS
Cottonwood Branch
Stewart Creek
FRISCO
Tf
HoA
HoB
AuC2
SeC2
ScB
AuB
EdD2
HoB2
EdB
HcC2
HcD2
LeC2
FeE3
To
0
½
1 Mile

(Joins sheet 30)

37

N



(Joins sheet 38)

0 5 000 Feet

(Joins sheet 44)

(Joins sheet 31)

N

(Joins sheet 37)

(Joins sheet 45)

West Rowlett Creek

Rowlett Church

0 ½ 1 Mile

(Joins sheet 39)

0 5 000 Feet

AuB
HoA
HoB2
AuC2
HoB
AID2
LeC2
HuB
ScB
US 75
UNDER CONS
SOUTHERN PACI
RIDGEVIEW MEMORIAL PARK
Cottonwood Creek
121
75
5
(Joins sheet 38)

0 ½ 1 Mile

(Joins sheet 32)

39

N

Fairview
Mt Olive Church
MC KINNEY COUNTRY CLUB
Wilson Creek
Sloan Creek
Friendship Church
Lovejoy School
Forest Grove
Wetsel
UNDER CONST
US 75
PACIFIC
SOUTHERN

(Joins sheet 40)

(Joins sheet 46)

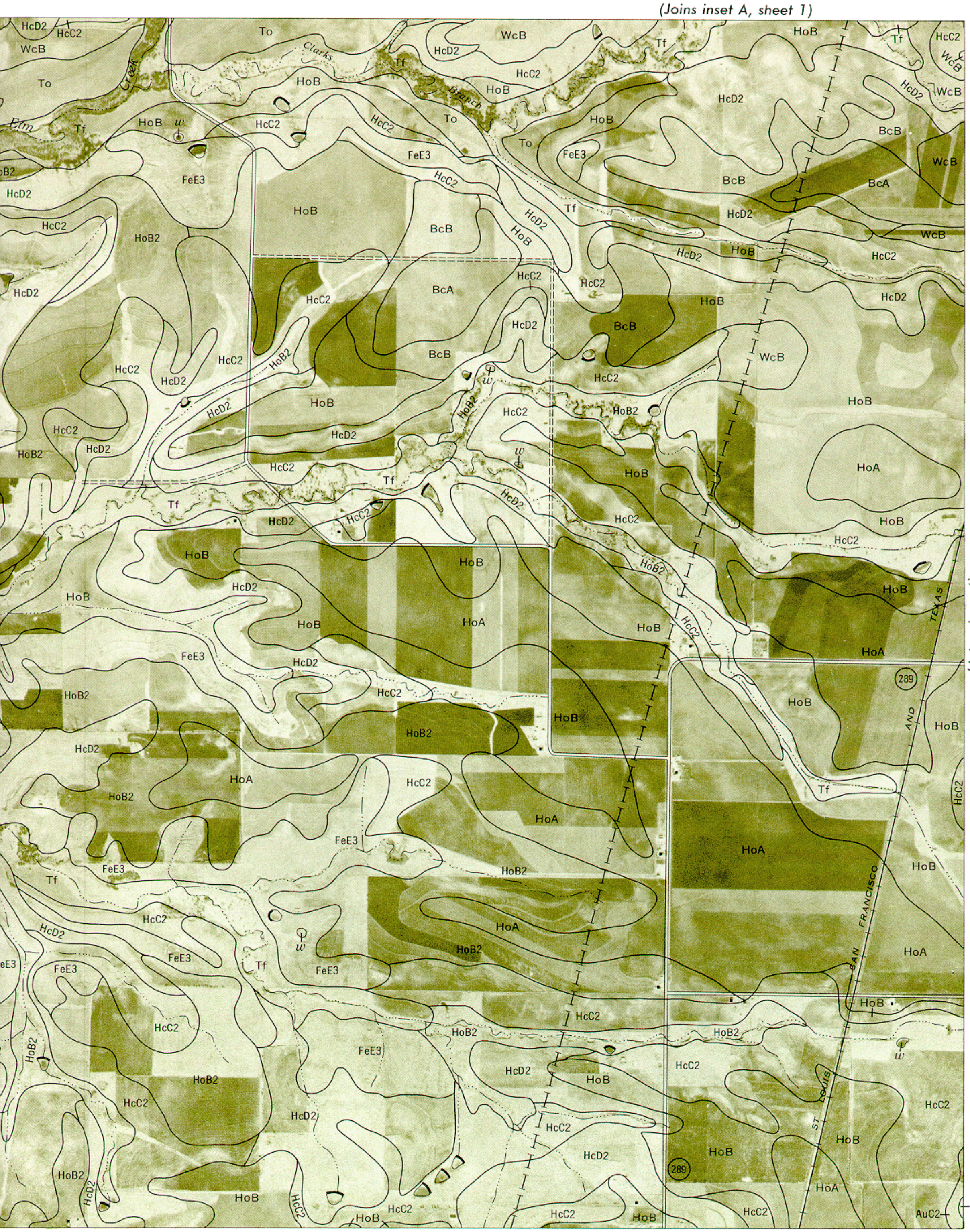
0 5 000 Feet

DENTON COUNTY
INDEFINITE BOUNDARY
Little Elm Creek
Little Elm Creek
0
½
1 Mile

(Joins inset A, sheet 1)

3

N



(Joins sheet 4)

0 5 000 Feet

(Joins sheet 9)

N

HoB (Joins sheet 33)

(Joins sheet 39)

(Joins sheet 47)

0 ½ 1 Mile

(Joins sheet 41)

(Joins sheet 40)

0 ½ 1 Mile

(Joins sheet 34)

0 5 000 Feet

(Joins sheet 48)

42

(Joins sheet 35)

N

(Joins sheet 41)

(Joins sheet 49)

0 ½ 1 Mile

(Joins sheet 43)

ile 0 5 000 Feet

(Joins sheet 36)

FARMERSVILLE

Markham

L & A

A T & S F

LOUISIANA AND

North Lake

South Lake

Elm Creek

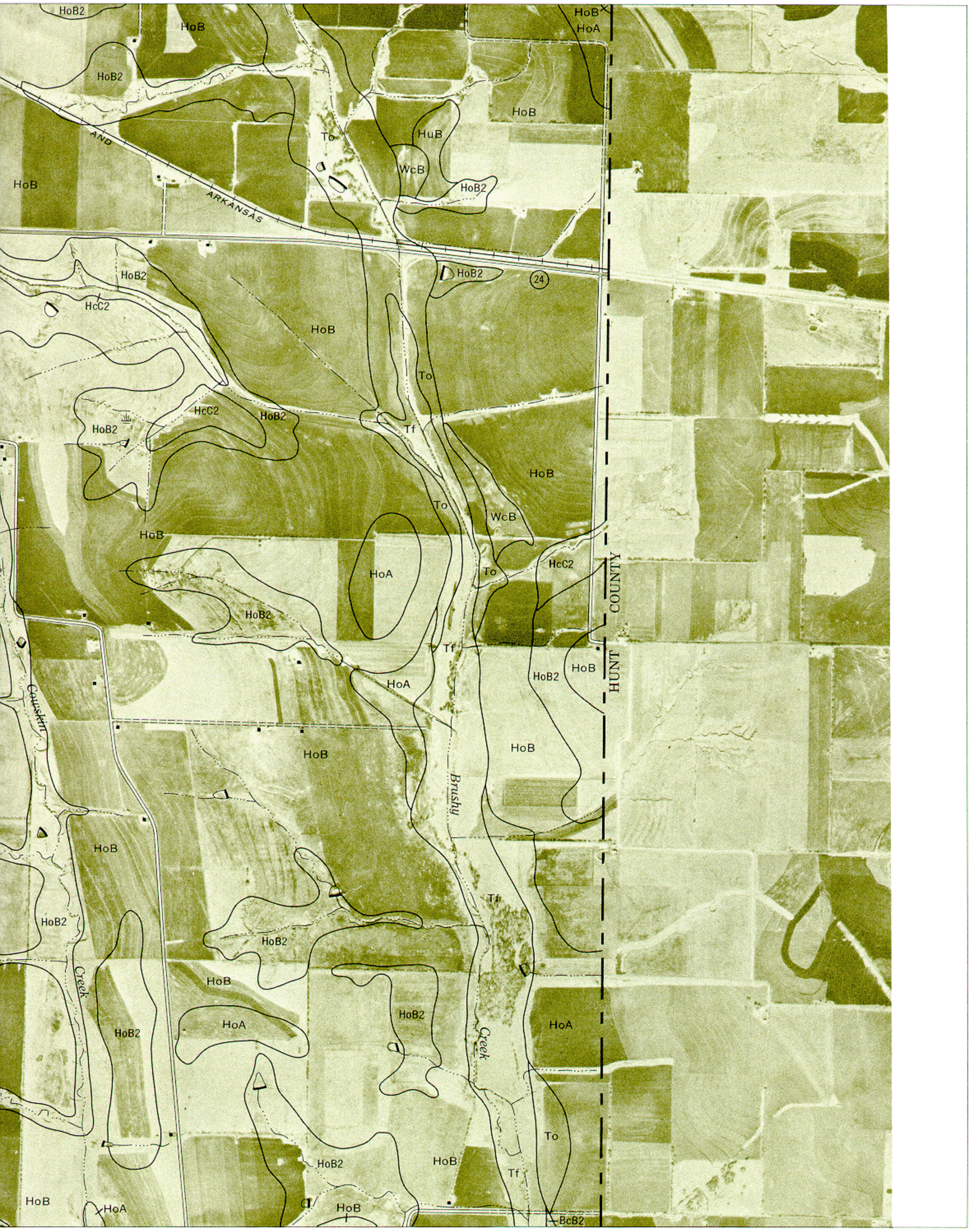
Cowskin Creek

HoB HoB2 HoA HcC2 HcD2 FeE3 EnC2 LaD2 To Tf

0 ½ 1 Mile

(Joins sheet 42)

(Joins sheet 50)


43
N
HoB2
HoB
HoA
HuB
To
WcB
AND
ARKANSAS
24
HcC2
Tf
COUNTY
HUNT
Cowskin
Brushy
Creek
BcB2
0
5 000 Feet

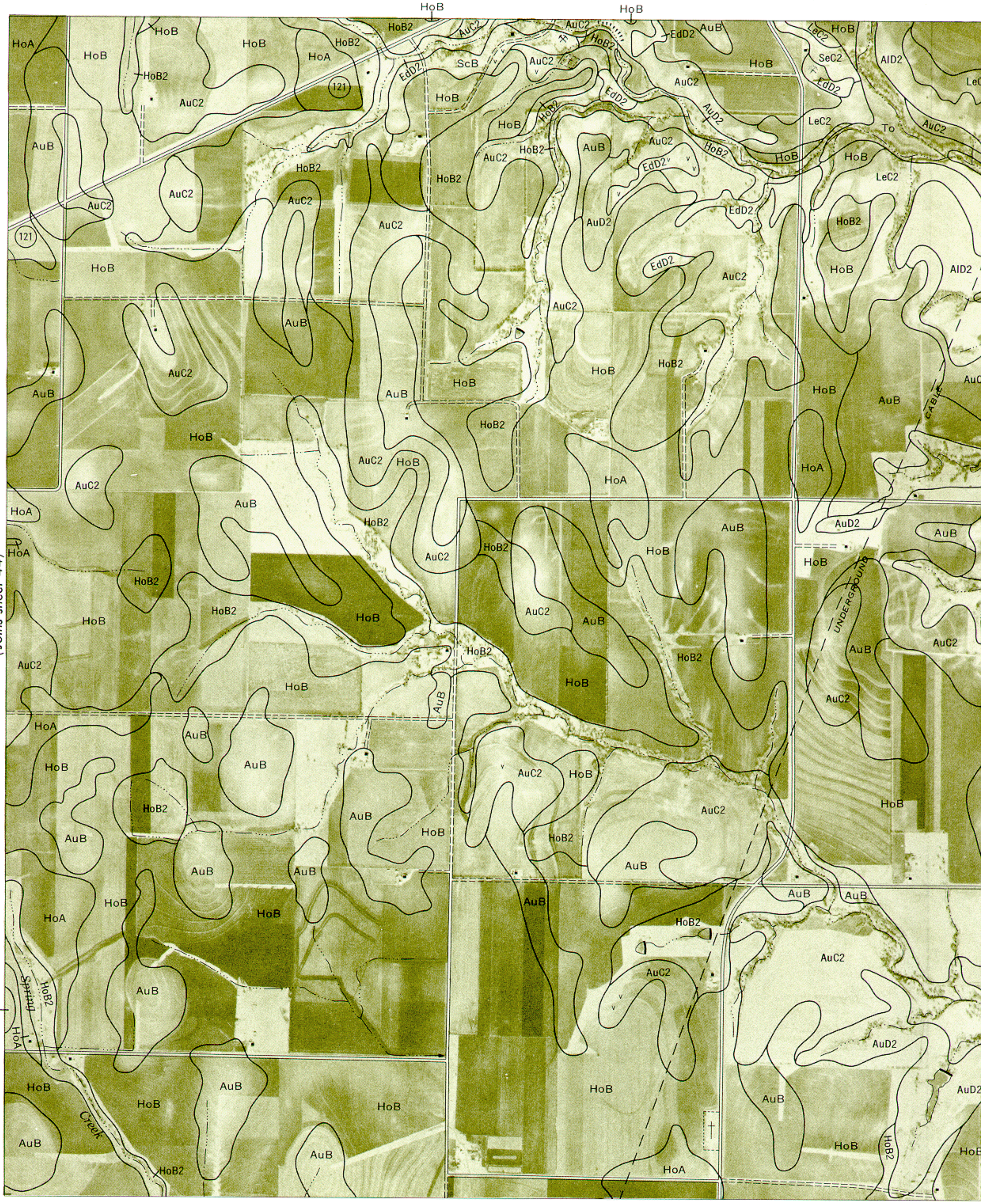
N
FeE3
HcC2
HcD2
EdD2
HoB
ScB
AuC2
SeC2
HoB2
AuB
HoA
EdB
DENTON COUNTY
INDEFINITE BOUNDARY
To
121
0
½
1 Mile

(Joins sheet 37)

(Joins sheet 45)

(Joins sheet 51)

0 5 000 Feet



(Joins sheet 44)

(Joins sheet 38)

45

N

(Joins sheet 46)

(Joins sheet 52)

0 5 000 Feet

(Joins sheet 39)

N

Allen

Allen School

ALLEN CEMETERY

PACIFIC

SOUTHERN

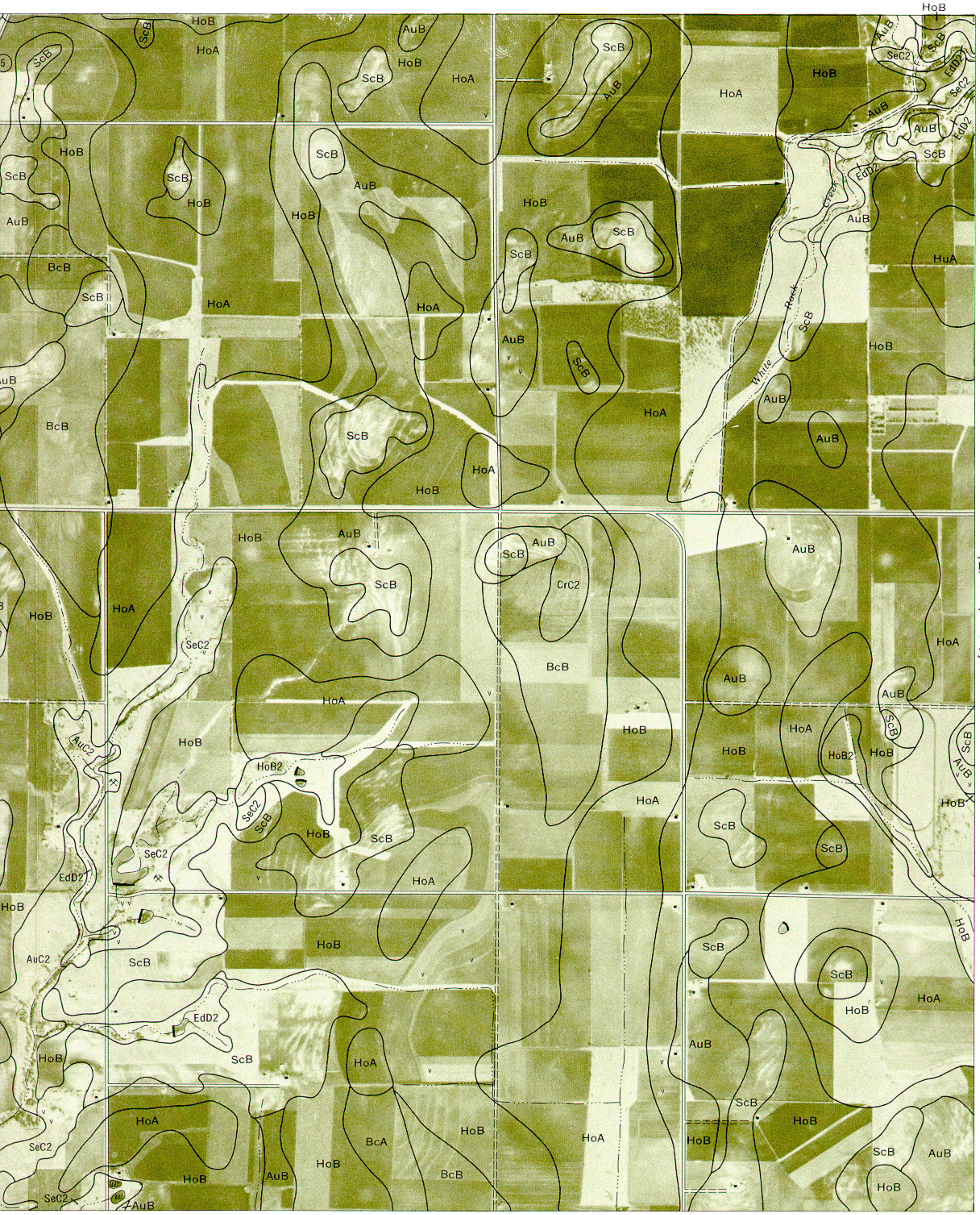
SEWAGE DISPOSAL

Cottonwood Creek

(Joins sheet 45)

(Joins sheet 53)

0 ½ 1 Mile



(Joins sheet 47)

(Joins sheet 46)

(Joins sheet 40)

N

McKinney Club Lake

Winningkoff

Trinity Park

LAVON RESERVOIR

(Joins sheet 48)

(Joins sheet 54)

0 5 000 Feet

N

(Joins sheet 41)

(Joins sheet 47)

(Joins sheet 55)

McKinney Club Lake

Branch Church

Branch

Clear Lake Church

Clear Lake

Creek

HoB HcC2 HoB HoB HoB HcC2 FeE3 HoB HcD2 HcC2

AlD2 HoB LeC2 HoB HoB FeE3 Tf To HoB HcD2 HcC2

Tf w w HoA HcC2 HcD2 To HcD2 HcD2

HcC2 HcD2 Tf FeE3 WcB

AlE3 HoB FeE3 HcC2 HcD2 HcC2 HoB HcC2 HcD2

LeC2 HoB HoB HoB2 HcD2 HcC2 HcD2

AlD2 HoB BcB WcB HoB HcC2

BcB HoA HcD2 HcD2

LeC2 BcA BcA HcD2

AlD2 HoB BcB BcA BcB FeE3 FeE3

HcC2 HcD2 HcD2 HcC2

WcB CrC2 BcB FeE3 HcC2

HoA HoA HoA BcA CrC2 BcB HcD2

LeC2 WcB HcC2

HoB HoA HcC2

AlD2 BcA WcB CrC2 HcD2

HoB2 BcA HoB

LeC2 BcB HcC2

AlD2 HoB HoB HcC2 FeE3

HoA HoB HoA HoB HcC2

AlD2 HcC2 HoB HoB HoB2 FeE3

HoB

0 ½ 1 Mile

HcC2
FeE3
WcB
HcD2
HoB
Tf
AID2
HoA
HoB2
AIE3
Lavon Beach Estates
Lavon Shores Estates
Yucate Acres
Pebble Beach
Sunset Acres
RESERVOIR
LAVON
Elm
(Joins sheet 49)
0
5 000 Feet

(Joins sheet 48)

(Joins sheet 42)

N

(Joins sheet 50)

(Joins sheet 56)

0 5 000 Feet

4

N

(Joins inset B, sheet 1)

(Joins sheet 3)

(Joins sheet 10)

0 ½ 1 Mile

(Joins sheet 5)

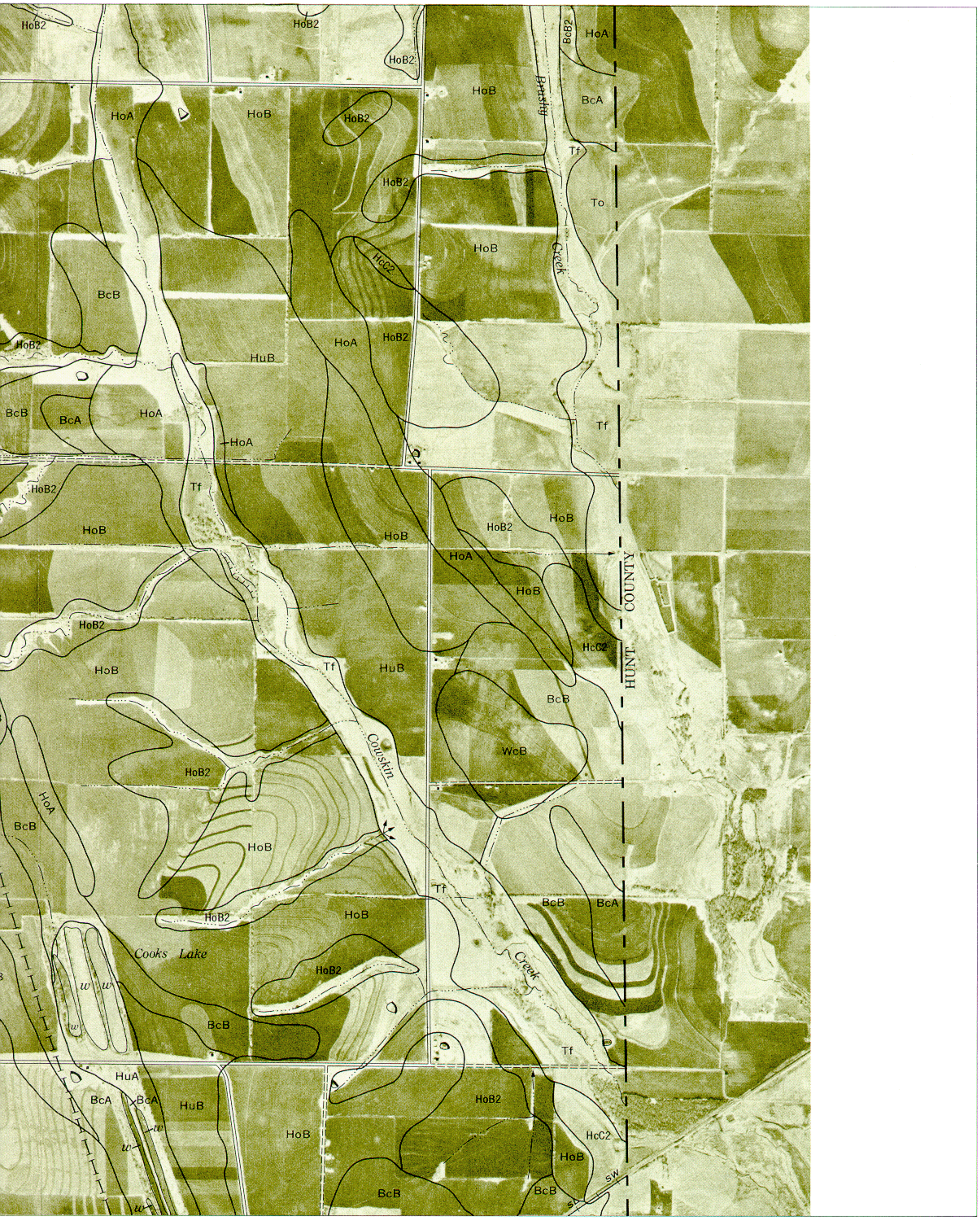
(Joins sheet 43)

N

(Joins sheet 49)

(Joins sheet 57)

0 ½ 1 Mile


HoB2
HoA
HoB
BcB
BcA
HuB
HcC2
Tf
To
Bransby Creek
HUNT COUNTY
WcB
Couskin Creek
Cooks Lake
HuA
SW
0
5 000 Feet

DENTON COUNTY
INDEFINITE BOUNDARY
White
Liberty Church
0
½
1 Mile

(Joins sheet 44)

51

N

HoB2 HoB AuB To 289 AuC2 HoA AuB HoB AuB HoA HoB HoB AuB ScB To AuB HoB AuB HoA AuB HoA HoB SeC2 AuC2 AuC2 AuB HoA HoB HoB AuB SeC2 To SeC2 AuC2 AuB Creek AuB AuB HoB AuD2 HoB HoB AuC2 AuC2 Fo AuC2 SeC2 AuB AuB ScB HoA AuC2 AuC2 HoB AuB Rock AuB SeC2 Fo AuC2 White HoB AuC2 AuB AuC2 ScB HoB AuC2 AuB AuB Fo AuD2 Fo SeC2 AuC2 HoB AuB ScB AuB HoA HoB AuC2 AuD2 EdD2 Fo AuB HoA SeC2 AuB AuC2 EdD2 AuB EdD2 EdD2 AuD2 EdD2 AuB AuC2 AuC2 AuB HoB HoB AuC2 HoA HoB HoA AuB HoB HoB AuB HoB2 AuB HoA HoB 289 HoA

(Joins sheet 52)

(Joins sheet 58)

0 5 000 Feet

52

N

(Joins sheet 45)

(Joins sheet 51)

(Joins sheet 59)

Fanny Harrington Chapel

CABLE

UNDERGROUND

Spring

Creek

0 ½ 1 Mile

AuC2
HoB2
HoB2
AuD2
AuD2
AuC2
Tf
HoB
AuC2
HoB
AuC2
AuC2
AuD2
HoB
AuC2
HoB
AuB
HoB
AuD2
HoB2
AlD2
AuC2
HoA
AuC2
AuB
HoB2
AuB
AuB
75
HoB2
HoB
AuB
AuB
HoB
HoB
HoB2
HoB
HoB2
HoA
HoB
PACIFIC
5
HoB
HoB
HoB2
AuB
HoA
AuB
AuB
AuC2
HoB
AuB
AuB
HoB2
HoB2
HoB
AuB
Spring
AuB
HoB
HoB2
Brown
AuB
AuC2
HoB
SOUTHERN
HoB
Br
AuC2
HoA
AuC2
AuB
AuB
AuB
HoB2
HoA
HoB2
HoB2
Bowman
AuB
HoB2
HoB
Branch
HoB
HoB
AuC2
Creek
AuB
HoB
AuB
HoB
AuB
HoB2
HoB
AuB
AuC2
AuC2
AuB
LeB
AuB
HoB
HoB2
LeC2
HoB
AuB
HoA
HoB2
AuC2
HoA
HoB
HoA
AuB
AuC2
HoB
AuB
AuB
HoB
LeC2
75
HoB
AuB
HoB
HoA
HoB
AuB
5
AuB
(Joins sheet 53)
0
5 000 Feet

(Joins sheet 52)

0 ½ 1 Mile

(Joins sheet 46)

N

Parker

Creek

Creek

Maxwell

(Joins sheet 54)

(Joins sheet 60)

0 5 000 Feet

(Joins sheet 47)

N

(Joins sheet 53)

(Joins sheet 61)

0 ½ 1 Mile

LAVON RESERVOIR
ST PAUL CEMETERY
(Joins sheet 55)
0
5 000 Feet

HoB HcC2 HoB HoA HoB2 HoA HoB HcC2 FeE3 BcA HcC2 HoB HcC2 HoB AID2 LeC2 LeC2 Beverly Hill HoB HoB2 LeC2 AIE3 HoB HoB FeE3 HoB AID2 LeC2 AID2 BcB BcA HcC2 HoA AID2 LeC2 LAVON LAKE ENCAMPMENT HoB2 LeC2 AID2 AIE3 HcD2 HoB AID2 BcB AID2 HcD2

(Joins sheet 54)

L A V O N

AIE3 AID2 FeE3 EAST FORK PARK HcD2 HoB HoA Lavon Lake Lodges HoB HcC2 HoA HcC2 AIE3 HoB HoB AVALON PARK AID2 Tf FeE3 HcC2 HoB HcD2 HcD2 HcD2 SOUTHWESTERN HoB Pumping Station HcC2 HcD2 HcC2 ST LOUIS LeC2 AID2 FeE3 BcB HcC2 HoA BcB2 HcC2 LeC2 HoB BcB HoB HoB HcC2 BcB HoA Tf HoB BcA BcB BcB2 BcA BcB AID2 HoB AID2 AID2 LeB HoB

0 ½ 1 Mile

(Joins sheet 48)

55

N

Little Ridge

RESERVOIR

ATCHISON TOPEKA AND SANTA FE

LAVON DAM

BORROW PIT

BORROW PIT

HcD2 HcC2 HoB HoB2 AID2 LeC2 BcB HoA AIE3 Tf LeB Pumping Station

(Joins sheet 56)

(Joins sheet 62)

0 5 000 Feet

56

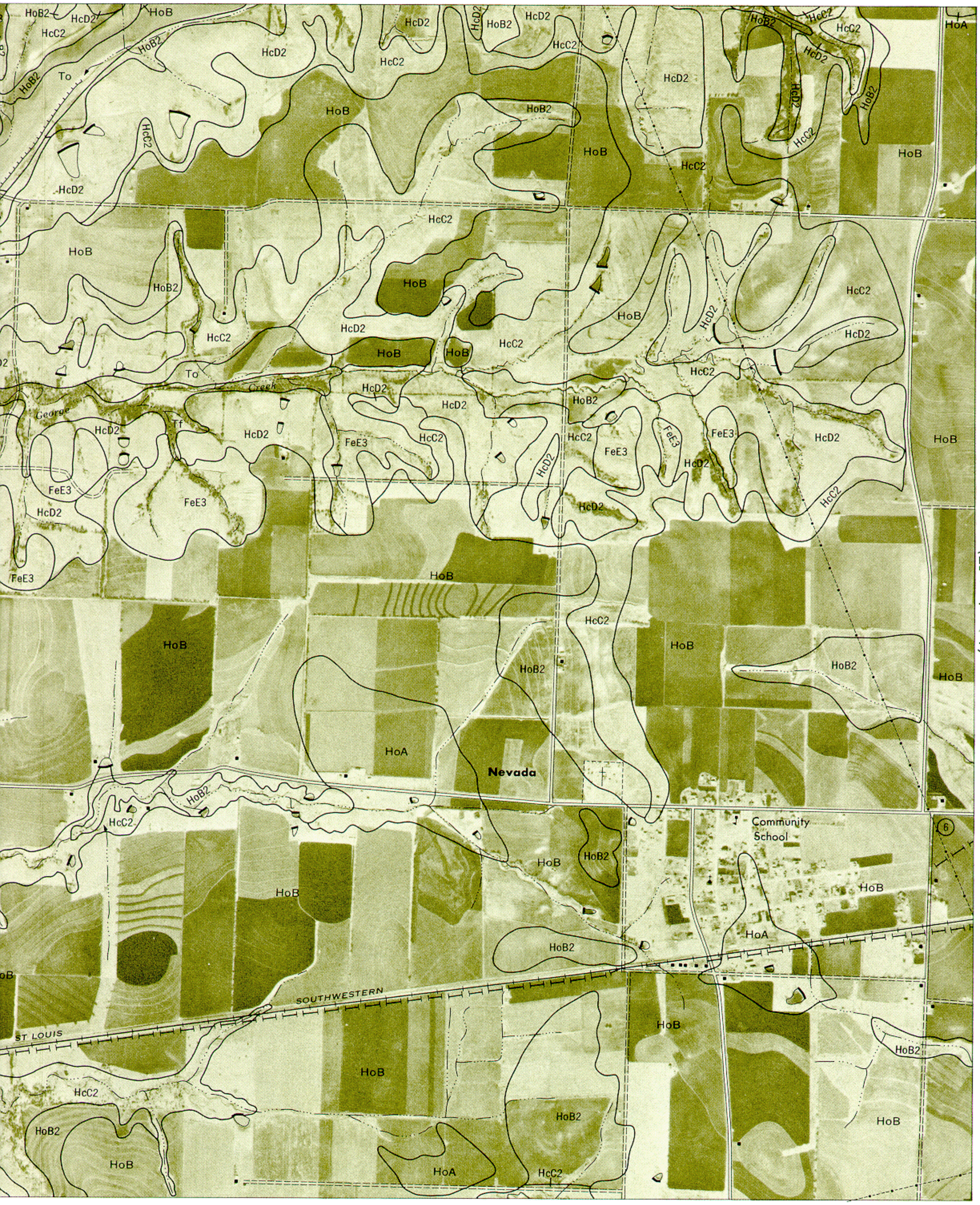
N

(Joins sheet 49)

(Joins sheet 55)

(Joins sheet 63)

0 ½ 1 Mile



(Joins sheet 57)

ile

0 5 000 Feet

(Joins sheet 50)

(Joins sheet 56)

(Joins sheet 64)

HoA
HoB
HoB2
BcB2
BcB
To
Tf
BcA
WcB
HcC2
HuB
SOUTHWESTERN
ST LOUIS
Sabine
Bois d'Arc Creek

0 ½ 1 Mile

N
HuB
HoB
HoB2
HcC2
HuA
BcA
BcB
BcB2
Josephine
6
HoA
WcB
WcA
Tf
Sabine
Creek
COUNTY
HUNT
3
0
5 000 Feet

N
INDEFINITE BOUNDARY
DENTON COUNTY
DALLAS COUNTY
White Rock Creek
HoB
ScB
AuB
AuC2
SeC2
EdD2
EdB
HoB2
HoA
BcB
LeB
LeC2
AuD2
Fo
0
½
1 Mile

(Joins sheet 51)

Shepton

ATCHISON TOPEKA AND SANTA FE

Rock Creek

Renner

289

SL

SW

(Joins sheet 59)

Mile

0 5 000 Feet

(Joins sheet 58)

0 ½ 1 Mile

(Joins sheet 52)

59

N

PLANO

Pittman Creek

Spring Creek

PACIFIC

SOUTHWESTERN

SOUTHERN

West Plano Substation

AuB HoA AuC2 LeC2 HoB AuB HoB HoB AuB ScB AuB AuC2 HoB2 Tf AuC2 HoB HoA AuC2 AuB HoB HoB2 HcC2 HoB2 AuC2 HoB Creek HoB AuC2 LeC2 HoB2 AuC2 HoB2 AuB AuC2 HoB HoB HoB HoB AuC2 LeC2 Creek LeC2 SOUTHWESTERN AuD2 HoB To LeB AuD2 AlD2 AuC2 LeC2 LeB HoA HoB HoB2 AuB AuC2 AuB AuB AuC2 AuB HoB AuD2 AuC2 AuC2 AuB HoB HoB AuC2 AlD2 To ScB AuB HoB LeC2 AuB AuC2 To HoB EdD2 AlD2 HoB LeB AuC2 AuB HoB

75

5

0 5 000 Feet

(Joins sheet 60)

ALLAS COUNTY

(Joins sheet 4)

(Joins sheet 1)

5

N

(Joins sheet 6)

(Joins sheet 11)

0 5 000 Feet

60

(Joins sheet 53)

N

(Joins sheet 59)

PLANO

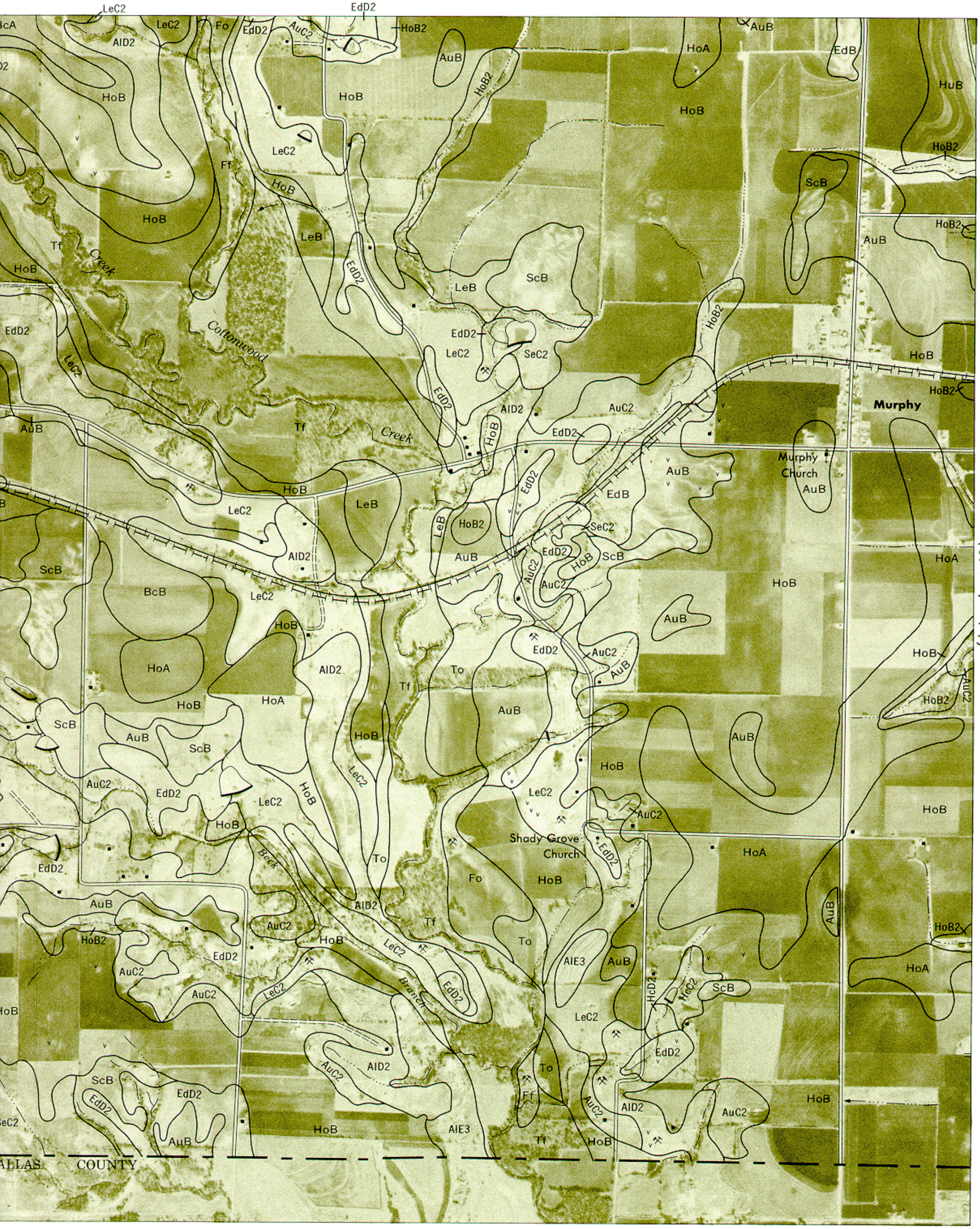
PLANO CEMETERY

ST LOUIS SOUTHWESTERN

Rowlett Creek

DALLAS COUNTY

0 ½ 1 Mile


LeC2
EdD2
AuC2
HoB2
AuB
HoA
EdB
HuB
AlD2
Fo
Ff
LeB
ScB
Tf
Creek
Cottonwood
HoB
Murphy
Murphy Church
Shady Grove Church
SeC2
BcB
To
AlE3
HcD2
HcC2
Beck
Branch
(Joins sheet 61)
0
5 000 Feet
DALLAS COUNTY

(Joins sheet 60)

0 ½ 1 Mile

(Joins sheet 54)

61

N

STRUCTURE SITE NO 5

FILTRATION PLANT

WYLIE

WYLIE SEWAGE DISPOSAL

ST LOUIS SOUTHWESTERN

TOPEKA

ATCHISON

SANTA FE

AND

Rush Creek

Muddy Creek

78

(Joins sheet 62)

0 5 000 Feet

LAS COUNTY

(Joins sheet 55)

N

(Joins sheet 61)

HoB BcA BcB SW SL A T & SF BcB BcB HoB LeB AID2 BcB2 AID2 LeC2 To HoB 78 HcC2 BcA HcD2 BcB BcA WcB HcD2 HoB HoB WcB HcD2 HoB HcD2 HoB WcB Tf HoB FeE3 HcD2 HcC2 BcB WcB FeE3 HcD2 FeE3 FeE3 HcD2 Tf AID2 Tf LeC2 HcC2 BcB LeC2 HcD2 LeC2 AID2 WcB AIE3 HoB AID2 LeB Rush HcC2 LeC2 Tf HoB AID2 WcB HcC2 LeC2 To AIE3 To River WcB HoB HcC2 To Tf Trinity LeC2 FeE3 AID2 HoB2 FeE3 HoB2 To Creek AID2 LeC2 WcB HcD2 HoB HcD2 WcB FeE3 HoB2 HcD2 WcA HuA BcB2 AID2 HoB AID2 To HoB HcD2 To Tf East Fork WcB BcB HcD2 BcA HuB HuB HoB

DALLAS CO ROCKWALL COUNTY

0 ½ 1 Mile

ile

0 5 000 Feet

(Joins sheet 62)

0 ½ 1 Mile

ROCKWALL COUNTY

(Joins sheet 56)

63

N

HcC2 HoB2 HoB HcC2 HoB HoB HoB2 HoB HoB2 HcC2 HoB2 HoA HoB2 HcC2 HcC2 HoB2 HcD2 HoA HoB2 HoB HoB HoB HcC2 FeE3 HcC2 HoA HoB2 HcC2 HcD2 HoB Tf Creek HoB2 Camp FeE3 HcC2 FeE3 FeE3 HcC2 HcC2 HcC2 FeE3 HcD2 HoB2 HoB HcC2 HoB HoB2 HcC2 HoB HoA FeE3 HcC2 HcD2 HcC2 FeE3 HcD2 HoB2 HcD2 FeE3 HcC2 HoA HoB2 HcD2 HoB FeE3 HcC2 HoB HuB HcC2 HoB FeE3 HcC2 HoB HoB HcD2 HoB2 HoB HoB HoB2 HcC2 HoB2 HcD2 HcC2 HoB2 HoA HuB HoB2 HoB

(Joins sheet 64)

KWALL COUNTY

0 5 000 Feet

64

N

(Joins sheet 57)

(Joins sheet 63)

HoB

HoB2 HoA To Tf HuB HoB BcB BcB2 HcC2 WcB CrC2 HcD2

Bois d'Arc Creek

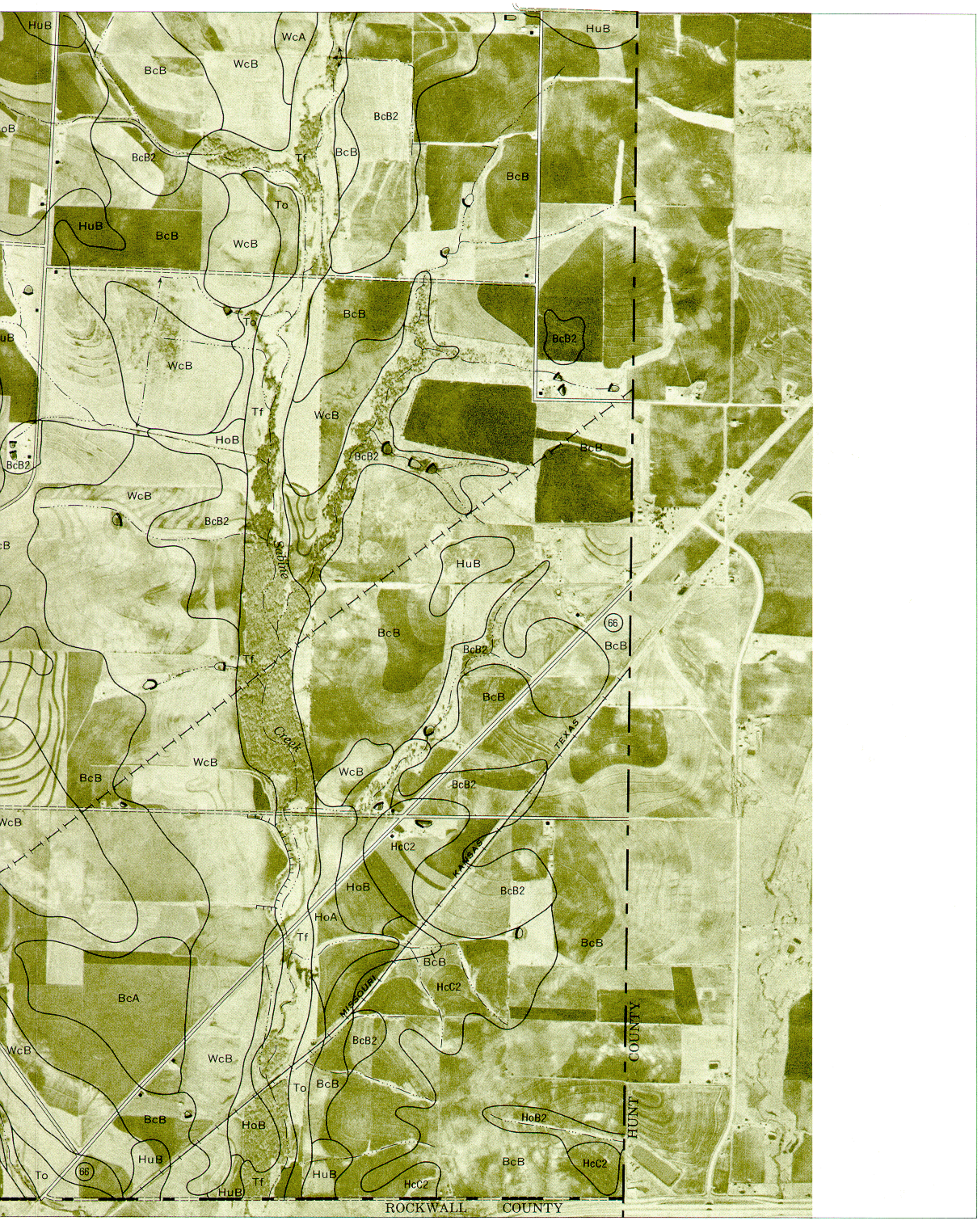
Pond

Branch

ROYSE CITY

66

0 ½ 1 Mile


HuB
WcA
BcB
WcB
BcB2
Tf
To
HuB
BcB
WcB
BcB
To
BcB
BcB2
WcB
Tf
WcB
HoB
BcB2
WcB
BcB2
Sabine
HuB
BcB
66
BcB
BcB2
Tf
Creek
BcB
WcB
WcB
BcB2
TEXAS
WcB
HcC2
KANSAS
HoB
BcB2
HoA
Tf
BcB
BcB
HcC2
MISSOURI
BcA
BcB2
WcB
WcB
COUNTY
To
BcB
HoB2
BcB
HuB
HcC2
To
66
Tf
HuB
HuB
HcC2
HUNT
ROCKWALL
COUNTY

0 5 000 Feet

(Joins sheet 2)
N
(Joins sheet 5)
(Joins sheet 12)
STRUCTURE SITE NO 42
STRUCTURE SITE NO 43
STRUCTURE SITE NO 44
UNDERGROUND CABLE
Hurricane Creek
Throckmorton Creek
HoB
HoB2
AuB
AuC2
AuD2
AID2
HcC2
LeC2
BcB
BcA
To
Fo
EdD2
HoA
0
½
1 Mile

ile

0 5 000 Feet

Rosamond Church
STRUCTURE SITE NO 3
STRUCTURE SITE NO 14
STRUCTURE SITE NO 15
Sweetwater Creek
Sister Grove Creek
Wolf Ruff Creek
Elm Creek
Grove Creek
(Joins sheet 6)
0
½
1 Mile

(Joins inset C, sheet 2)

7

N

AuD2

(Joins sheet 8)

STRUCTURE SITE NO 13

STRUCTURE SITE NO 15

Westminster

Creek

Grove

Elm

0 5 000 Feet

(Joins sheet 13)

(Joins inset B, sheet 2)
N
(Joins sheet 7)
(Joins sheet 14)
Desert
Pilot
Grove
Creek
0
½
1 Mile

AuC2
LeC2
HoB
EdD2
AuD2
To
HuB
HoB2
SeC2
AuB
ScB
EdB
Fo
HcC2
HcD2
AlD2
FeE3
HoA
WcB
Tf
HoB2
Creek
Desert
FANNIN COUNTY
160
78
121

0 5 000 Feet

DENTON COUNTY
INDEFINITE BOUNDARY
HoB2
HcC2
FeE3
HcD2
HoB
BcB2
BcA
EID2
CrC2
CrD2
HoA
To
Ø
w
0
½
1 Mile

(Joins sheet 3)

9

N

HcD2 HcC2 HcC2 HcC2 HcD2 HoB 289 HcD2 HoA AuC2 HcC2 HoB2 HoB HoB HcC2 TEXAS To HoB2 HcD2 HcC2 To HcD2 EdB EdD2 HoB2 HcC2 HcC2 FeE3 HoB2 HcC2 HcD2 HoB HoB2 EdB HcC2 EID2 FeE3 HoB HoB EdB HcD2 To w SAN FRANCISCO AuB HcC2 HoB HcD2 EdD2 ScB HoB HoB HcC2 AuC2 HoA SeC2 ScB w w HcC2 To HoB HcC2 HoB HoB HcD2 ScB HoB AuC2 HoB2 HcC2 ST LOUIS HoB SeC2 To HoB HcD2 HcD2 FeE3 HcC2 HoB AuC2 SeC2 AuC2 HoB HoA HoA LeB HoB HoB HcC2 AuC2 SeC2 CELINA EdD2 AuB EdB EdB AuD2 HoA HoB2 WcB CrC2 HcC2 AuC2 SeC2 EdB HoA HoB HcC2 w SeC2 AuB ScB HoB2 AuC2 HoA HcD2 EdD2 HcC2 SeC2 SeC2 w HoB HoB HcC2 HoA HoB Branch Doe HcC2 HoB2 BcA HcC2 HoB HoB HcC2 HoA LeC2 HcC2 CELINA CEMETERY 289 AuB HoB SeC2

(Joins sheet 10)

0 5 000 Feet

(Joins sheet 16)

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are those of nearly level soils. A final number, 2 or 3 in the symbol, shows that the soil is eroded or severely eroded.

SYMBOL	NAME
AlD2	Altoga silty clay, 5 to 8 percent slopes, eroded
AlE3	Altoga silty clay, 8 to 12 percent slopes, severely eroded
AuB	Austin silty clay, 1 to 3 percent slopes
AuC2	Austin silty clay, 3 to 5 percent slopes, eroded
AuD2	Austin silty clay, 5 to 8 percent slopes, eroded
BcA	Burleson clay, 0 to 1 percent slopes
BcB	Burleson clay, 1 to 3 percent slopes
BcB2	Burleson clay, 2 to 4 percent slopes, eroded
CrC2	Crockett soils, 2 to 5 percent slopes, eroded
CrD2	Crockett soils, 5 to 8 percent slopes, eroded
EdB	Eddy gravelly clay loam, 1 to 3 percent slopes
EdD2	Eddy gravelly clay loam, 3 to 8 percent slopes, eroded
ElD2	Ellis clay, 3 to 8 percent slopes, eroded
EnB	Engle clay loam, 1 to 3 percent slopes
EnC2	Engle clay loam, 3 to 5 percent slopes, eroded
FeE3	Ferris–Houston clays, 5 to 12 percent slopes, severely eroded
Ff	Frio clay loam, frequently flooded
Fo	Frio clay loam, occasionally flooded
HcC2	Houston clay, 3 to 5 percent slopes, eroded
HcD2	Houston clay, 5 to 8 percent slopes, eroded
HoA	Houston Black clay, 0 to 1 percent slopes
HoB	Houston Black clay, 1 to 3 percent slopes
HoB2	Houston Black clay, 2 to 4 percent slopes, eroded
HuA	Hunt clay, 0 to 1 percent slopes
HuB	Hunt clay, 1 to 3 percent slopes
LaC2	Lamar clay loam, 3 to 5 percent slopes, eroded
LaD2	Lamar clay loam, 5 to 8 percent slopes, eroded
LaE3	Lamar clay loam, 5 to 12 percent slopes, severely eroded
LeB	Lewisville silty clay, 1 to 3 percent slopes
LeC2	Lewisville silty clay, 3 to 5 percent slopes, eroded
ScB	Stephen silty clay, 1 to 3 percent slopes
SeC2	Stephen–Eddy complex, 3 to 5 percent slopes, eroded
Tf	Trinity clay, frequently flooded
To	Trinity clay, occasionally flooded
WcA	Wilson clay loam, 0 to 1 percent slopes
WcB	Wilson clay loam, 1 to 3 percent slopes

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries
- Mine dump
- Pits, gravel or other

Power line
- Pipeline
- Cemetery
- Dams
- Levee

Tanks

Well, oil or gas

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent

Wells, water (flowing)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

Lavon Reservoir
- Normal or conservation pool, elevation 472 feet
- Flood control pool, elevation 490 feet
- Normal shoreline
- Intermittent shoreline

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1964 aerial photographs. Controlled mosaic based on Texas plane coordinate system, north central zone, Lambert conformal conic projection, 1927 North American datum.